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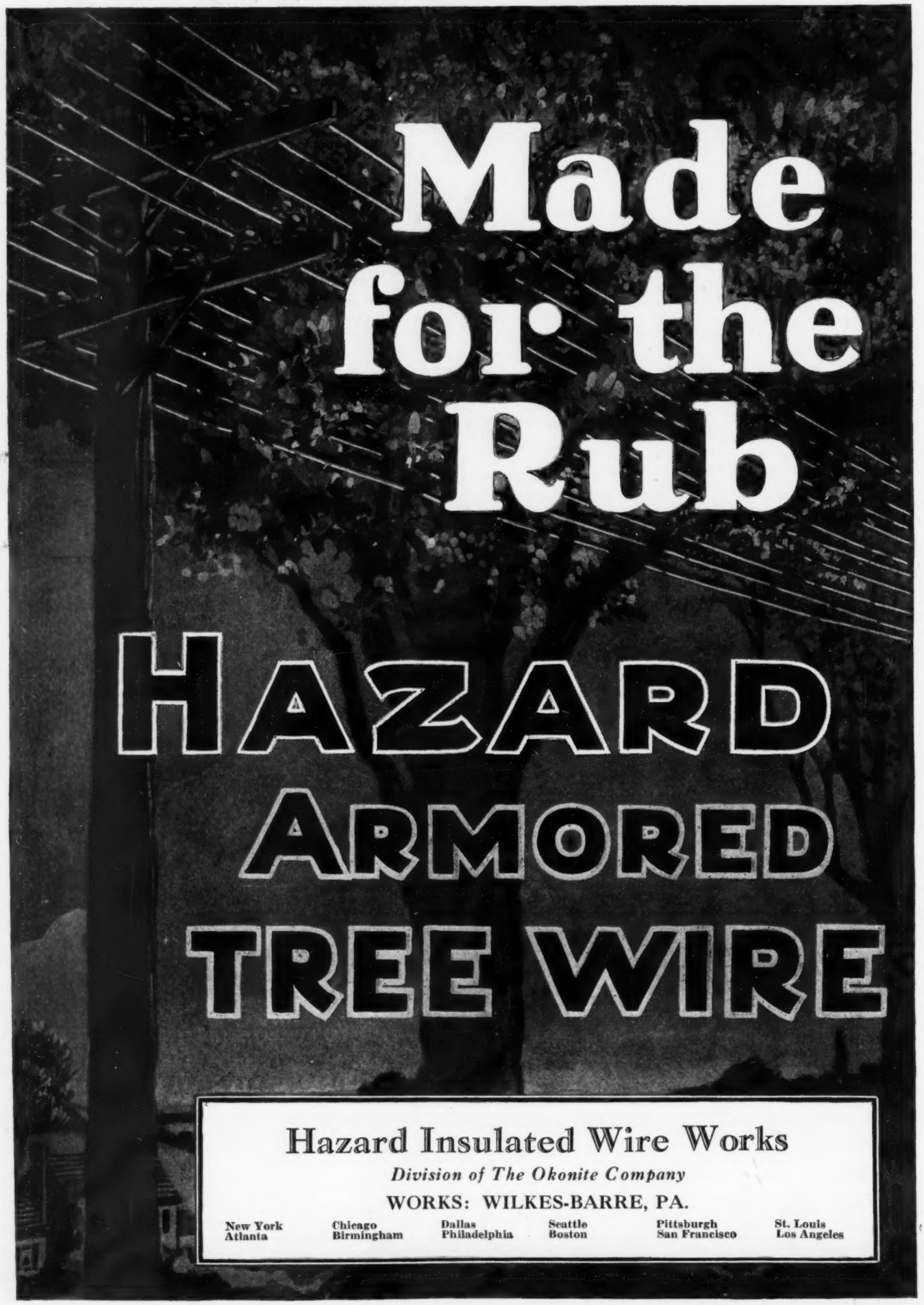
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Are We to Have Better Appliances?

IN ITS program for encouraging better domestic appliances the Association of Edison Illuminating Companies has indeed adopted the wiser plan. Encouragement for improvement, and not arbitrary criticism of manufacturers' products, will yield, with manufacturers' cooperation, ultimate benefits to the users and may dispel some of the growing clouds of opprobrium which devices poorly designed, fabricated and assembled have from time to time tended to form. That the association concedes this to be no trifling problem lightly injected into its deliberations is amply indicated by the personnel of the committee of eminent presidents and vice-presidents to which the task of solution has been delegated. The Electrical Testing Laboratories, the working agents, have a long record of painstaking, intelligent and resourceful investigations and under the plan outlined in this issue of the Electrical World should again contribute wisely to the progress of the electrical industry.

Manufacturers are understandably jealous of their rights and privileges, but they may conceivably profit as much as any of the interested parties. Everybody's business is notoriously the concern of no one, and while almost every one connected with the electric industry has talked about remedies for this appliance situation, all have at the same time with amazing unanimity joined in doing nothing whatever about the matter. It is high time to welcome a move of such well-intended proportions and see what can be accomplished, for there is little to be lost and much to be gained.

Any program for improvement that affects many interests in theory should be undertaken by all as a co-operative project, but practical considerations often require action by one group. This action later often develops into an industry program. Constructive work on electric appliances is needed and is under way.

* * * *

A Staff Man for Co-ordination in Research

WHAT is going on in research? What has and what has not been done? These and other questions arise frequently of late because of the large number of unco-ordinated researches going on in this country. There is need for clarification and co-ordination in order to avoid duplication of effort and to start new projects at the proper jumping-off place. In addition, the status of researches under way and the results achieved should be made known quickly.

A constructive suggestion for the electrical industry is that a research committee be formed and that it have a paid secretary at N.E.L.A. headquarters. This man could maintain a file covering all research projects, could keep informed as to their progress, could help start new projects at the best places and with adequate resources, could arrange for making results known, and, in general, could make himself a focal point and clearing house for utility research. This suggestion has received the hearty indorsement of the Engineering National Section and of C. F. Hirshfeld, chairman of the special research committee of the association. It is also suggested that the N.E.L.A. research committee be made up of the chairmen of the several committees of the Engineering National Section. Both suggestions are good and, if followed, will improve the status of utility research work.

The same idea of a central clearing house and a greater co-ordination for research could be carried out in other organizations of the electrical industry to good advantage, and other industries would do well to think about some analogous plan. Research results, let us repeat, should be made available quickly; research projects should be located to best advantage; new researches should be started properly, and the existing status of researches should be kept up to date. It takes some kind of organization to accomplish these desirable results. No fear need be had of interference or dictation as to the actual carrying out of research projects—once started a research lies wholly under the control of the research workers. The task of the industry staff man is to help research reach its goals and to help industry know what research is accomplishing.

* * * *

Power Costs and High Pressure

IT IS important that power costs be kept to a minimum. This is the approach to decisions in regard to steam-power-plant engineering. At present several attempts are being made to secure cost reductions. These may be listed as the use of high pressure, the use of high temperature, greater simplicity in layout, the use of larger units, the use of combination heat cycles or multiple fluids, and the use of processed fuel with by-product sales.

Great advances have been made in the use of high pressure, and the article by Dr. Loeffler in this issue shows vividly the claims that are typical of those advocating it. There is little doubt that pressures up to 2,000 pounds can be used in practical power stations. But is this an economical procedure?

An economic balance sheet is not a thermal balance sheet. Facts and figures on costs and performances should be checked against analytical and hypothetical statements. Nor should miniature installations be used to predict values for large power plants. Nor is there much meaning to a statement that a high-pressure station can be built for the same unit price as a low-pressure station—some low-pressure stations have been built for

$80 a kilowatt and some for $150 a kilowatt under the same general service conditions.

It is urgent that an economic evaluation be made for the 400, 600 and 1,200-pound stations now in operation. Variable conditions should be reconciled and adjusted. Cost sheets should show the total fixed and operating charges per unit of power. The data are available, and there is little excuse for dealing in generalties. Since the industry must build about 1,500,000 kilowatts of new stations each year, it should build them to produce power at the lowest cost. Experimentation should go on with high pressures and with other possibilities, but major power stations should be built in the light of cost and operating data available in existing plants. There is no need for opinion when facts are available.

Greatest hopes for a reduction of power costs at present lie in the economic use of pressure and the intelligent design of stations. Full advantage should be taken of both weapons. Opinions should be converted to dollar values and theoretical data to operating records.

* * * *

Harness That Lightning

LIGHTNING is the biggest handicap to economic progress in the electrical industry. Because the fundamental phenomena are unknown, an enormous excess investment is being made in an attempt to "play safe." Line insulation, transformer insulation, system stability, generator insulation and a host of other technical problems reduce to the dollar fact that an ignorance of lightning introduces guessed-at factors of safety that in turn require excess or guessed-at investments. And service continuity is a direct function of lightning. Duplicate and triplicate transmission lines, duplicate buses and transformers, added generating stations and multiple arresters are some dollar investments that are necessary because the industry guesses at lightning phenomena and guesses at the answer to the lightning problems.

There is no other single handicap to cost reduction and to technical advancement that can be compared with lightning. Years of effort to find out about it has developed very little of quantitative value. Some progress has been made, especially in the development of instruments to measure lightning values and to imitate lightning, but no data are available to fix the fundamental facts needed to harness it.

Co-operation can produce the facts in a year. Field data are needed, and the project involves a cost and a scale of operation beyond the capacity of a single property or a single manufacturer. The present work by three or four groups will get some data but will not be conclusive. Its results will be reached slowly. Each group has a limited fund and a few instruments, and data are limited by the flashover values of the operating transmission lines.

There is a valid economic reason to justify an expenditure by the industry of $200,000 to $300,000 a year for two or three years to get the facts about lightning—they would be cheap at the price. An industry effort should be made, in co-operation with the National Research Council and other agencies, to get a field project under way. Expert talent and equipment should be mobilized and focused on the problem. The dollar value of these research results would be enormous to the several branches of the electrical industry and to the nation. Research facts will eliminate the economic waste due to an ignorance of lightning phenomena. Why not get the facts?

Improving Interconnection Practice

CONSCIENTIOUS study of interconnection operations backed by patient endeavor to co-operate for the good of all participants is being rewarded on not a few systems by improved service, more cordial team play and increased savings in fuel, labor and capital charges. This does not mean that all the major problems have been solved—far from it. The spread of this movement in the industry has been too swift to permit reducing the uncertain factors influencing its economic operation to negligible values, and from all indications the further extension of high-voltage trunk tie lines over increasingly large areas seems bound to tax the best mental resources and administrative skill of operating engineers for some time to come.

The scope of modern interconnection practice is little realized by many electrical men who give passing glances to major tower and pole lines on their way through particular territory. The trend is very marked toward increasing the number of participants in these tie-ins, and complications grow fast as areas and systems with little neighborhood interest in common take their places in the picture. When one goes over the records of such power pools and listens to a recital of the difficulties especially associated with working at arm's length in co-operating and negotiating power transfers, surprise arises that the results have been so excellent. The successful operation of a multilateral interconnection under present conditions is a tribute to the hard-working service of numerous unnamed load dispatchers and their superiors, added to liberal open-mindedness in the managements concerned. This is illustrated by willingness to co-operate with those associated in the interchange for the maximum good of the group.

Present improvements follow varied lines. The selection of personnel to operate power pools is receiving more attention. There is a tendency to include in centralized load-control offices men who are intimately acquainted with the details of participating systems. Supervisory travel between load-dispatching centers is becoming more frequent in representative cases. Communication is being set up on a better engineering basis, though much remains to be done here. There is need of more effectively handling the ways and means of transmitting information during emergencies and even in normal periods. Thought is being given to the possibilities of developing apparatus and lines for massing scattered instrumental readings of importance at certain administrative centers. Automatic control of frequency from a selected regulating plant is making promising records. In order that time may not be lost in the marketing of surplus water and secondary steam power, many companies have consented to a greater centralization of power-transferring authority than was permitted in earlier days when operators had to feel their way toward maximum effective interchange.

Operating records have greatly improved; graphic analyses and filing methods reveal a broader grasp of principles and control of procedure, and the allocation of costs including investment and running expenses has attained a degree of mastery far beyond the situation prevailing even five years ago. Pessimists may contend that the complications of interconnection may in time lead to its breakdown on account of the difficulties of training personnel and the weight of responsibility in

sight if not yet reached; but a detached study of the manner in which obstacles have been overcome in the past warrants the conclusion that success will always follow hard work and engineering ability coupled with tact and intercompany public spirit.

* * * *

No Longer Damned for Damming

WHEN a utility company contemplates the development of a stream for power production fishermen and outdoors men usually resent the idea and often loudly protest. Economic considerations may in truth sometimes prevail over love of natural beauty, but when it is remembered how many ardent lovers of nature there are among utility men themselves, one may be sure that this is not always the case. It has become quite customary, none the less, to hear water-power companies damned by lovers of the wild. Hydro-electric companies that gain the commendation of fishermen are almost as scarce as museum specimens.

In the current issue of *Field and Stream* the Consumers Power Company of Michigan is so pictured that it becomes the object of envy of hydro-electric companies everywhere. Once damned for damming the Muskegon River and spoiling fishing, it has voluntarily redeemed itself in the eyes of fishermen and other lovers of outdoors by planting fish in the great backwaters created by the dams and by reforesting the watersheds. This company did not let criticism stop its contribution to those who criticised. Neither did it confine its planting of fish and trees to one year. This work has been continued for years, and now the nature lovers are beginning to reap the benefits. They echo the words of the author of the *Field and Stream* article, who says: "I wish some other streams were 'spoiled' like this one."

* * * *

Setting the Stage for Progress

DRAMATIC developments in the power industry are under way in the Northeast. Two major power networks in New England and Canada have been brought under common control by the formation of the International Hydro-Electric System, a subsidiary of the International Paper & Power Company. These networks, or, more properly, power systems, are embodied in the New England Power Association and the Canadian Hydro-Electric Corporation, Ltd. The combined hydro-electric generating plants completed and under construction comprise more than 1,037,000 hp.; undeveloped water-power sites aggregate nearly as much, and steam plants add 382,000 hp. to the system's resources. The two major groups will be geographically separated by a gap of only about 200 miles upon the inauguration of service from the Fifteen-Mile Falls development into Massachusetts, and thus they offer interesting possibilities for the interchange of surplus power through appropriate international agreement.

Rapidly moving events on such a scale seldom escape attack by self-seeking politicians and the sensational press, and in the past fortnight the "power trust" bogy has been worked overtime as a result of the acquisition of a majority interest in the Boston *Herald-Traveler* by the International Paper coterie. The announcement that this interest was acquired to insure an outlet for newsprint paper produced by the parent organization is apparently too simple a business reason to be acceptable to the self-appointed St. Georges who would seem to slay a non-existent dragon by beating their spears against brass in the hope of being heard throughout the country. Certainly, one needs only to scan the pages of the most "reactionary" newspapers of America to realize the utter absurdity of trying at this late day to suppress anti-utility material of news value by buying even a 100 per cent interest in any press property whatever. And when it comes to editorial comment, are the advocates of government—political—ownership to have a monoply of the right to put their ideas before the reading public?

There are many advantages in the establishment of a single control over neighboring power systems like these. The ultimate objective of a successful policy must be the most economical over-all production, transmission and distribution of power throughout the region occupied or available for future profitable service. Such efficiency, it stands to reason, will be better assured by an organization having interests on both sides of the international border than by companies forced to seek their own advantage in interchange operations. Only through the abandonment of selfish interests can the maximum group benefits be realized, and the prospect is brightest for the best service and the lowest ultimate rates through properly organized and progressively managed central control.

* * * *

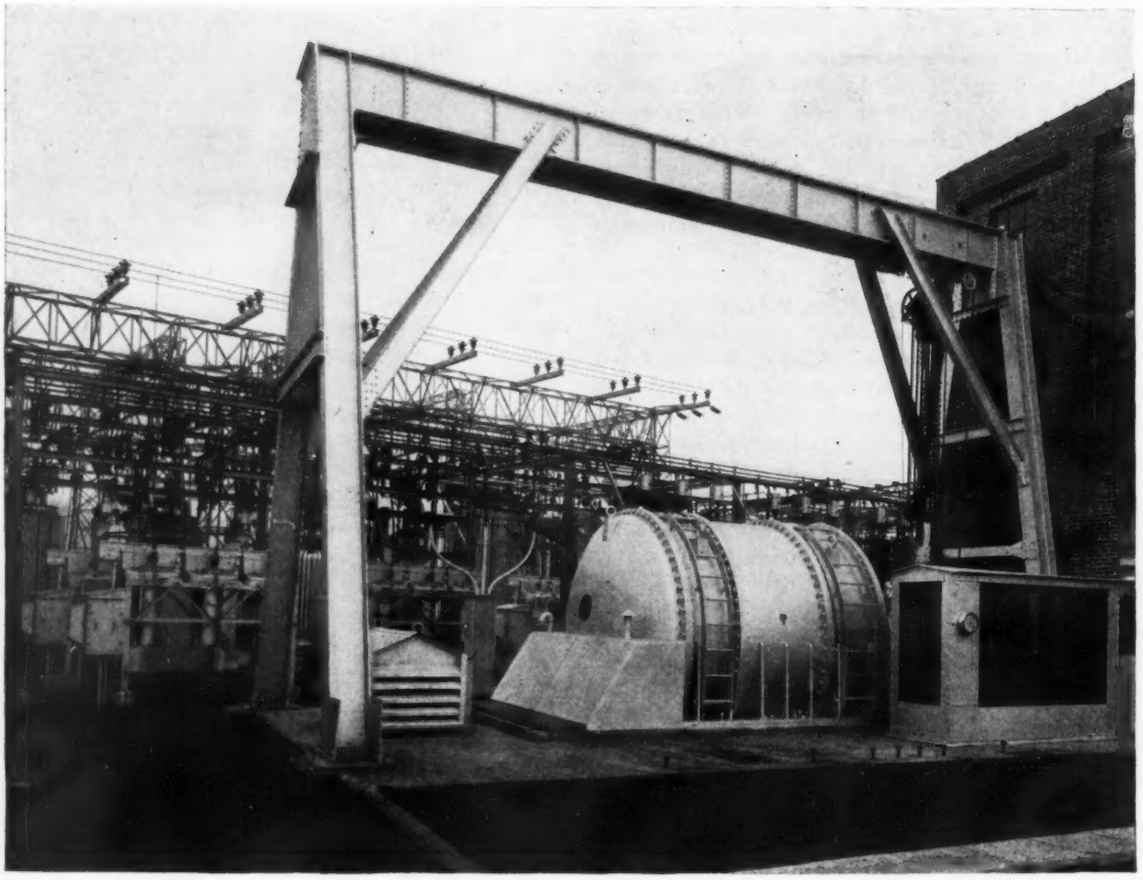
Painless Payments for Highway Lighting

THE dear, dead days when the trolley-car conductor scrambled puffingly over and past riders in a mildly conscientious endeavor to collect fares was brought to a close by what a merry quipster so aptly labeled the "Payasyougoic" age. This general era in turn has passed, and today we have a business game which might be sloganed "painless payments." Ultimately the consumer, or rather the public, must, of course, pay; but grand pianos, motor cars, radios, refrigerators and homes are sold "on time" because it is easier to abstract a dollar down and a dollar a week than it is to dent the bank roll at one blow. Why not do as much for highway illumination costs?

One way to secure highway lighting of sufficient intensity and adequate modernity may be to make the capitalization of lighting facility costs a part of the construction expense in providing a complete section of highway. The highway would be more costly by a few thousand dollars; the bill paid the utility for lighting service would be reduced by at least the amount of fixed charges on lighting equipment and presumably limited to an energy, maintenance and supervisory expense, and the community would apparently be getting a wholly desirable something for less money.

After all, the job of building a mile of highway, if it is to be considered a complete and usable section, must include considerations for lighting it, and the physical property is not only so many cubic yards of concrete, gutters, culverts and aprons, but the fixtures, poles, standards and copper for lighting purposes. Interest payments on funded debts are often far easier to obtain than appropriations for highway lighting. Painless payments for perfect highways are more attractive than uncomfortably large bills for lighting service.

20,000-Kva. Hydrogen-Cooled Condenser



AT THE Turner substation of the Appalachian Electric Power Company, near Charleston, W. Va., is installed the 20,000-kva., 11,000-volt, hydrogen-cooled synchronous condenser shown. It has been operated several months with perfect satisfaction. The concentration of hydrogen in the machine is maintained at a constant percentage by floating tanks with delicate valve control.

The operating room is shown at the right and other equipment is installed in the concrete pit under the condenser. The unit was built by the General Electric Company and is said to be the largest hydrogen-cooled condenser now in operation.

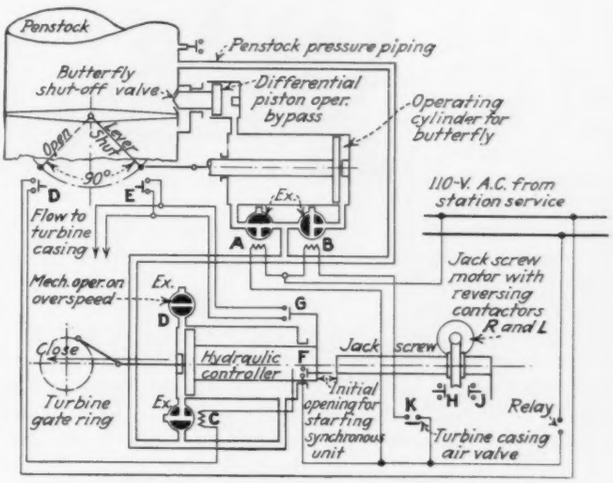
Hydraulic Control for
Automatic Hydro Plant

Governor on 7,000-kva., full-automatic hydro station replaced by automatic hydraulic controller and shutdown device. Plant operates on block load. Frequency controlled by system

By E. A. CRELLIN

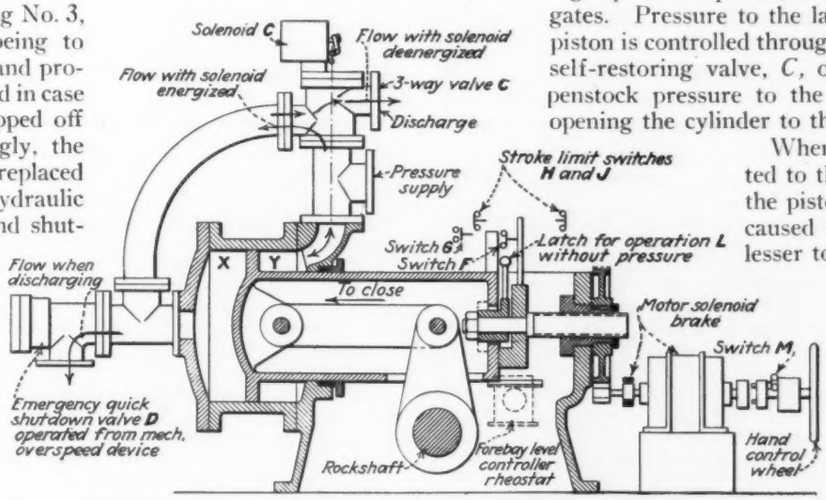
Assistant Engineer Division of Hydro-Electric and Transmission Engineering, Pacific Gas & Electric Company, San Francisco, Calif.

IN MAY, 1924, the Pacific Gas & Electric Company entered into a contract with the Nevada Irrigation District under which the district would deliver annually 108,000 acre-ft. of water into the company's Lake Spaulding storage reservoir, located at a high elevation in the Sierra Nevada Mountains of central California. The power company agreed to transport this water through its South Yuba and Drum Canals, generating power en route, finally returning the water to the district for irrigation use. This water, together with additional natural flow which can be developed, will, it is estimated, generate some 190,000,000 kw.-hr. annually. For the use of this water the power company has agreed to pay the district approximately $370,000 per year. This amount will in large measure pay the interest and sinking fund requirements on the district's bonded indebtedness in constructing its works.



Full-Automatic Control for 7,000-Kva. Hydro Plant Using Shut-Down Device

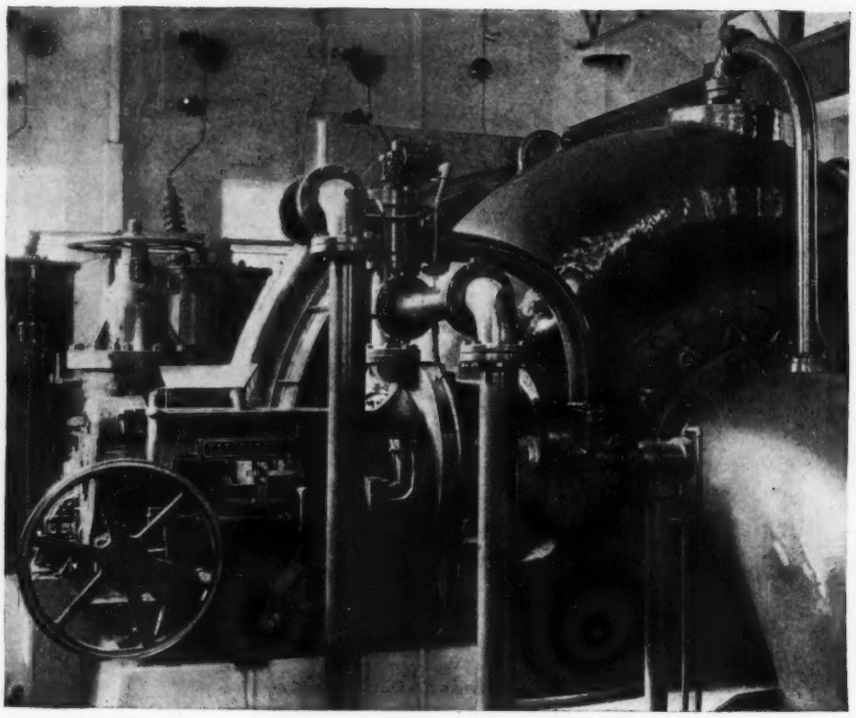
To utilize this additional water supply the power company has constructed a full-automatic plant, known as Spaulding No. 3, containing a single 7,000-kva. unit operating under an effective head of 309 ft. The plant will operate under a continuous block load, delivering its output into a relatively large system, the frequency of which is controlled by a single governing hydro plant. Under these conditions a governor is unnecessary on a small unit such as the one installed in Spaulding No. 3, its only function being to shut down the unit and protect against overspeed in case the generator is tripped off the line. Accordingly, the governor has been replaced by an automatic hydraulic turbine controller and shutdown device operated by water pressure directly from the penstock. The controller consists of a cylinder containing a differential piston and a motor-operated jackscrew as shown in the accompanying diagram. One side of the piston, *X*, has approximately twice the area of the other side, *Y*. The small area side, *Y*, of the piston is continuously subjected to penstock pressure, which, acting upon the piston, will close the turbine gates. Pressure to the large area side of the piston is controlled through a solenoid-operated self-restoring valve, *C*, one piston admitting penstock pressure to the cylinder, the other opening the cylinder to the drain.



Hydraulic Controller Substituted for Governor in Automatic Hydro Plant

When pressure is admitted to the large area side of the piston by this valve it is caused to move against the lesser total pressure exerted by the water on the small area side of the piston, at the same time opening the turbine gates. The motion of the piston in the opening direction is governed by a motor-operated jackscrew, which is not mechanically

connected to the piston, but controls its position by pushing it in ordinary jackscrew fashion or backing away to let the water move it in the other direction. The motor-operated jackscrew can definitely be controlled and adjusted for any load condition. Since the jackscrew is not mechanically attached to the piston, the turbine gates can be quickly closed by opening the valve *C* to the drain, thus permitting the penstock pressure against the small area side of the piston to move it to the shut-down position and to suspend operation of the plant.



Hydraulic Controller and Shut-Down Device for Automatic Hydro Plant

The main shut-off butterfly valve and its bypass valve also make use of a differential piston for their control. This is indicated in the schematic diagram. The smaller area of the bypass valve is subjected to penstock pressure tending to open the valve. It will open when pressure is released from the large area side of the piston by operating solenoid self-restoring valve *A*. The cylinder for closing the butterfly and the bypass are interconnected, being closed and held closed by the same water. The opening of the butterfly is accomplished by the operation of control valve *B*, which admits water under pressure into the butterfly valve-operating cylinder under the proper conditions.

While the plant is essentially a block load plant, provision is made for following any fluctuations in the water delivered to the penstock intake structure by means of a water level control equipment consisting of two faceplate type rheostats and a balanced relay. These are interconnected and operate the jackscrew motor of the hydraulic controller so as to adjust the load for any given water level which may be maintained by the flow in the canal. In addition to the usual electrical overspeed tripping device, the unit is equipped with a mechanical overspeed shut-down device set at about 10 per cent higher speed than the electrical device and designed to operate in case of failure of the electrical equipment. It consists of a centrifugal element on the main turbine shaft which actuates a pilot valve to release pressure from the drain valve *D*, allowing it to open and cause the hydraulic controller to close the turbine gates.

The foregoing description has covered the automatic equipment especially developed for this plant. The electrical equipment for automatic control and protection consists of the usual relays and contactors.

The tailwater from Spaulding No. 3 enters Lake Spaulding, where it is combined with water from other sources. The water drawn from Lake Spaulding follows two separate routes to the lower elevations. The major portion passes through Spaulding power house No. 1, thence into the Drum Canal to supply Drum power house and, finally, Halsey and Wise power houses. The lesser portion flows through Spaulding power house No. 2, thence through the South Yuba Canal to Deer Creek power house. After passing through the power

Sequence of Operations

The normal sequence of operations at Spaulding No. 3 as outlined in the following may be understood more clearly by reference to the accompanying schematic diagram. Assume the plant shut down and not locked out by any protective device, then the incoming 60-kv. line may be energized from Spaulding No. 1, causing a single- and reverse-phase relay to pick up, in turn closing the master relay and energizing the control bus. A relay then closes, energizing the solenoid on valve *A*, which permits the bypass valve to open and fill the turbine scroll case. As soon as the scroll case has filled the air-release valve at the highest point on the scroll case seats, closing auxiliary switch *K* and energizing the solenoid of the main butterfly-operating valve *B*.

As soon as the main butterfly valve has completed its opening stroke auxiliary switch *D* closes to complete the circuit through the hydraulic controller-operating valve *C*. This permits the hydraulic controller to move from the position of fully closed turbine gates to one-tenth gate opening, at which point it is held by the position of the jackscrew.

At one-tenth gate opening the turbine starts and comes up to normal speed in approximately 1½ minutes. When the turbine has come up to 96 per cent of synchronous speed a centrifugal switch on the end of the shaft closes its contacts, completing the circuit through the closing coil of the generator oil circuit breaker, thus connecting the unit to the line.

As soon as the generator oil circuit breaker closes the field contactor closes, putting normal field on the generator. Also, the circuit is completed through the forebay float control equipment and the unit automatically builds up to a load corresponding to the amount of water available at the forebay.

houses of the Pacific Gas & Electric Company an amount of water equivalent to that originally supplied by the irrigation district is returned to it at an elevation of approximately 750 ft. above sea level for irrigation purposes.

Lumber Treating by Non-Pressure Process*

By T. A. Wilson

Superintendent Timber Department, Consolidated Gas, Electric Light & Power Company, Baltimore, Md.

IT IS possible, by the non-pressure process, to secure full sapwood penetration on practically every species of wood in commercial use. To fulfill this requirement, regardless of moisture content of the wood, necessitates careful study of temperatures as well as of durations of treatment. The non-pressure process should not be confused with the dipping process, which is usually confined to submersion from five to fifteen minutes in hot creosote, as the former requires from four to thirty-six hours. The Consolidated Gas, Electric Light & Power Company at its treating plant has secured adequate temperatures, under positive control, during hot and cold baths.

The equipment of this plant consists of one 20,000-gal. cold storage tank, one 7,500-gal. hot storage tank, two open-top treating tanks each 7 ft.x14 ft.x10 ft. deep, for butt-treating of poles, and one tank 4 ft.x5 ft. 8 in.x 41 ft. long for treating lumber and timbers. This latter tank is equipped with a removable cover. A motor-driven derrick handles material in and out of treating tanks and a gasoline crawler crane performs the yard work. Recording thermometers register on twenty-four-hour charts the temperatures of creosote in each of the storage and treating tanks. Level indicators register in feet and hundredths of a foot the height of creosote in each of the horizontal storage tanks. These levels calibrated in gallons are typed in pamphlet form for ready reference in calculating not only the amount of preservative used in each hot and cold treatment, but also the amount of creosote unloaded from tank cars.

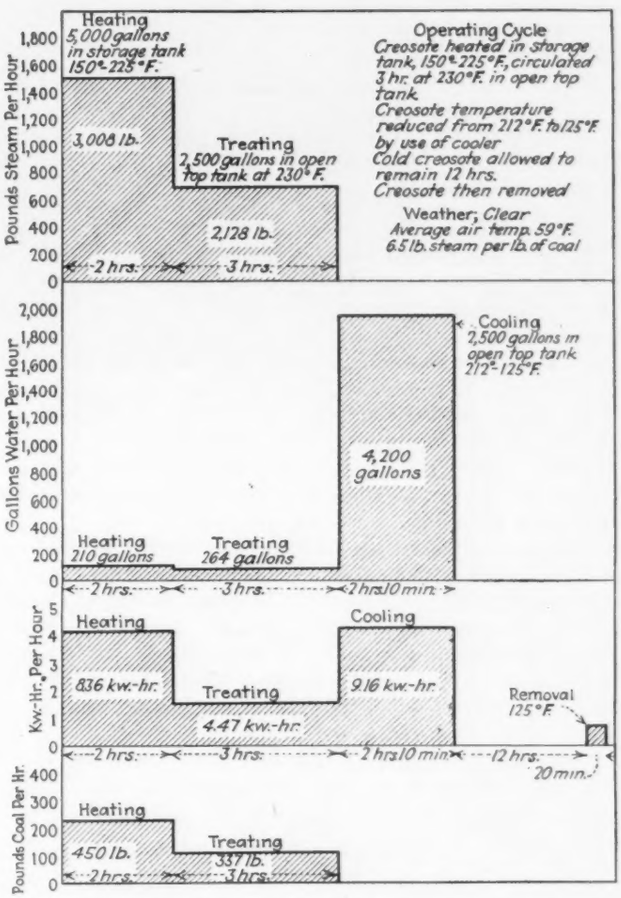
The hot-storage tank and the treating tanks are not heated by steam coils as is customary. Steam supplied by a 50-hp. boiler is furnished to a circulating heater. The preservative is forced by motor-driven pumps through this heater from and to the hot-storage tank and each of the treating tanks, as required. By this means the temperature of the preservative may be raised one degree per minute in the hot-storage tank, and, due to the location and proportion of inlets and outlets in the treating tanks, a uniform and constant temperature is insured throughout these tanks during the treating cycle. At the same time the preservative is kept thoroughly agitated.

**Excerpts from an address by Mr. Wilson at the twenty-fifth annual meeting of the American Wood Preservers' Association.*

Results Obtained in Non-Pressure Treatment of Rough, Sawed Lumber

Species	Sapwood, Per Cent	Volume of Timber, Cu.Ft.	Weight Before Treatment, (Pounds)	Increase in Weight After Treatment, Lb. per Cu.Ft. A	A&B	A&C	Moisture Content, Lb. per Cu.Ft. Before Treatment	After Treatment	Creosote Absorption, Lb. per Cu.Ft.
Douglas fir	0	0.62	22.00	4.0	....	....	5.65	3.84	5.8
Douglas fir	0	0.71	24.63	0.4	10.5	....	5.22	3.61	12.1
Douglas fir	0	1.16	42.75	7.3	....	....	5.77	5.29	7.8
Douglas fir	0	1.15	42.88	7.3	10.5	....	5.45	3.58	12.4
Douglas fir	0	3.94	128.88	2.7	....	....	4.72	4.46	3.0
Douglas fir	0	4.00	140.88	1.8	....	....	5.25	4.81	2.2
Douglas fir	2	4.13	138.00	2.2	2.8	....	4.89	4.76	2.9
Douglas fir	0	4.00	140.38	2.0	2.4	....	4.92	4.84	2.5
Average	..	....	.....	3.4	....	....	5.23	4.40	6.1
Cypress	0	0.68	23.00	4.4	7.0	....	4.18	3.51	7.7
Cypress	0	0.68	21.88	10.0	....	....	3.83	3.37	10.5
Cypress	0	0.40	14.00	38.3	....	33.8	4.55	3.07	35.3
Cypress	0	0.80	29.50	33.9	....	....	4.76	3.54	35.1
Average	..	....	.....	21.6	....	....	4.33	3.37	22.2
Southern pine	33	0.65	24.75	22.2	....	20.0	5.22	3.89	21.3
Southern pine	90	0.63	21.25	35.4	....	....	4.34	4.77	35.0
Southern pine	25	1.16	47.25	5.8	6.5	....	5.29	4.20	7.6
Southern pine	0	1.15	50.38	2.8	....	....	5.42	4.74	3.5
Southern pine	67	3.33	141.75	21.2	....	....	7.79	8.26	20.7
Southern pine	67	3.33	136.50	24.6	....	23.1	7.52	9.36	21.3
Southern pine	10	4.13	191.25	6.8	....	....	7.00	6.57	7.2
Southern pine	5	4.03	197.50	6.4	7.5	....	7.38	7.36	7.5
Southern pine	8	6.13	247.25	5.3	....	....	5.93	5.84	5.4
Average	..	....	.....	14.5	....	....	6.21	6.11	14.4
Red oak	0	0.87	40.63	9.9	12.8	....	5.53	4.17	14.2
Red oak	1	0.66	32.00	3.1	....	....	5.62	4.55	4.2
Red oak	0	1.55	69.25	13.6	....	....	5.98	4.84	14.7
Red oak	0	1.54	62.50	2.6	3.4	....	5.44	4.53	4.3
Red oak	10	1.50	89.50	5.0	....	....	17.56	18.60	4.0
Red oak	10	1.50	83.13	5.1	6.3	....	16.33	16.80	5.8
Red oak	0	1.50	77.13	8.9	10.4	....	12.62	13.50	9.5
Red oak	0	1.50	78.50	10.0	....	....	12.85	13.60	9.3
Average	..	....	.....	7.3	....	....	10.24	10.07	8.3
General average	..	....	.....	10.4	....	....	6.79	6.35	11.4

Treatment A—5½ hours at 220 deg F.; 1¾ hours cooling by circulating cooler at 127 deg. F.; 2¾ hours at 127 deg. F.
Treatment B—2½ hours at 230 deg. F.; creosote withdrawn and replaced at 120 deg. F.; 4½ hours at 120 deg. F.
Treatment C—1¼ hours at 220 deg. F.



Consumption of Coal, Steam and Electricity During Treating Cycle

The circulating heater is also equipped to be used as a cooler, by the substitution of water for steam, to reduce the temperature of the preservative for the cool treatment, without exposing the material to the air, as is customary in the change from hot to cool baths.

With this process of uniform temperatures under positive control it has been possible to determine the most desirable temperatures to be used for a given charge. Experiments in arriving at these temperatures consisted of repeated tests at 200 deg F. and at each 5-deg. interval up to 240 deg. F. with several different species and dimensions of wood.

Steel Mill Motor Equipment*

By J. B. Ink

American Rolling Mills Company, Middletown, Ohio

THE new continuous bar plate and hot strip mill recently placed in service by the American Rolling Mill Company at Middletown, Ohio, produces ingot iron and various grades of steel strip in gages down to 0.093 in. and widths up to 48 in., also plates $\frac{1}{4}$ in. thick and 60 in. wide in 75-ft. lengths. These products are rolled from 6-in. thick slabs, 39 in. long, and of the width required in the finished product. The mill consists of eleven stands. The first seven constitute the "bar mill" and normally reduce the sheet to about $\frac{3}{8}$ in. thickness. The last four stands are the "hot strip mill."

Stands five to eleven inclusive are driven by 600-volt d.c. adjustable speed motors. Due to the necessity for close speed regulation, and the fact that the piece is in the stand a considerable length of time, flywheels are impracticable on these stands. The motors, therefore, must provide maximum rolling torque. The stands are all four high, 56 in., working rolls 18 in. diameter, backing up rolls 36 in. diameter, roller bearings.

The mill auxiliaries are with a few exceptions motor operated; 220-volt squirrel-cage induction type motors with magnetic cross-line starters are used for all constant-speed, continuous-duty applications, such as fans, pumps and chain tables between mills. These motors are in sizes from 2 to 75 hp. They are standard sleeve-bearing motors with drip-proof covers. The cross-line starters provide low-voltage protection and have thermal overload relays. For intermittent duty, on loads having high starting torque and requiring quick acceleration, 250-volt d.c. mill type series or compound motors are used. This includes all cranes, transfer tables, roller tables, except hot strip runout table; furnace pushers, pinch rolls, and screw-downs. The controls for these motors are all of the magnetic definite time limit acceleration type.

The 4,000-kw., three-unit, synchronous, motor-generator sets supply 600-volt direct current for the main mill motors; 25-volt direct current for auxiliary motor circuits is supplied by two 750-kw. motor-generator sets and 250-volt excitation by a 300-kw. motor-generator set. The excitation bus may also be supplied from the 750-kw. motor-generator sets.

Each 4,000-kw., 600-volt motor-generator set consists of two 2,000-kw., 600-volt generators rigidly coupled to a 5,800-hp., 85 per cent power-factor, 6,600-volt, 60-cycle, 14-pole synchronous motor. The two 750-kw., 250-volt generators are driven by 1,080-hp., 900-r.p.m., 80 per cent power-factor synchronous motors and the 300-kw., 250-volt exciter by a 432-hp., 1,200-r.p.m., 80 per cent power-factor, 6,600-volt synchronous motor.

**Abstract of paper presented before regional meeting of the Middle Eastern District of the A.I.E.E., Cincinnati, Ohio.*

Table I—Characteristics of First Four Stands

Motor	Hp.	Speed Synchronism	Flywheel Hp. Sec.	Gear Ratio	Mill R.P.M.	Roll Diameter (In.)	Roll Ft./Min
1	800	514	30,000	35.1	14.42	32	121
2	800	514	30,000	35.1	14.42	32	121
3	1,000	600	40,000	29.1	20.18	32	169
4	1,200	720	40,000	29.1	24.3	32	203.5

Table II—Characteristics of Stands Five to Eleven

Motor	Hp.	Speed	Gear Ratio	Mill R.P.M.	Roll Ft./Min.
5	2,000	300–500	8.1 :1	37.1/ 61.70	174.7–291.0
6	2,000	300–500	6.00:1	50 / 83.3	235.4–392.0
7	2,000	300–500	5.32:1	56.4/ 94.1	266.0–443.0
8	3,000	180–360	3.02:1	59.6/119.2	280.5–561.0
9	3,000	180–360	2.26:1	79.7/159.4	375 –750.0
10	3,000	180–360	1.87:1	96.3/192.6	454 –908.0
11	3,000	180–360	1.72:1	104.8/209.6	494 –988.0

Table III—6,600-Volt, Three-Phase, 60-Cycle, 40 Deg. C. Rise Motors on First Four Stands

Motor	Hp.	Poles	Efficiency ¼	Efficiency ¾	Efficiency Full Load	Power Factor ¼	Power Factor ¾	Power Factor Full Load	Per Cent Slip Full Load	Max. Torque Full Load
Nos. 1 and 2	800	14	90.8	92.8	93.25	67.8	78.4	82.9	1.13	2.9
No. 3	1,000	12	92.4	93.6	94	74.2	82.3	85.7	1.167	2.62
No. 4	1,200	10	91.3	93	93.6	78.6	85.8	88.9	1	2.92

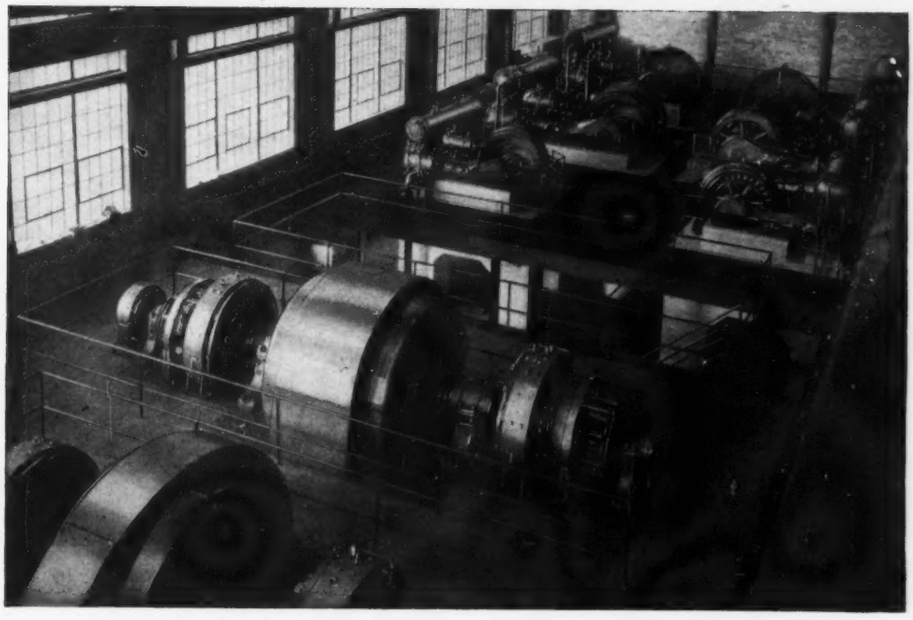
Table IV—Motors on Last Seven Stands

All 600-Volt—Separately Excited at 250 Volts, 40 Deg. C. Rise

No. of Motors	Hp.	Poles	R.P.M.		Efficiency ¼ Load	Efficiency ¾ Load	Efficiency Full Load		Efficiency ¼ Load	Efficiency ¾ Load	Efficiency Full Load
3	2,000	10	300–500	At 300 r.p.m.	93.2	93.7	93.6	At 500 r.p.m.	91.3	92.4	92.6
4	3,000	14	180–360	At 180 r.p.m.	92.5	93.85	93.8	At 360 r.p.m.	91.9	92.9	93

Table V—Rating and Performance of Motor-Generators

Generator Kw.	Generator R.P.M.	Generator Volts	Generator Poles	Motor Hp.	Motor Power Factor, Per Cent	Set Efficiency ¼ Load	Set Efficiency ¾ Load	Set Efficiency Full Load
4,000	514	600	10	5,800	85	86	88.75	89.7
750	900	250	6	1,072	80	83.1	86.4	87.7
300	1,200	250	4	432	80	84.5	87	87.5



Machine floor of Timken - Canton substation. Motor-generator sets in foreground and air compressor in background.

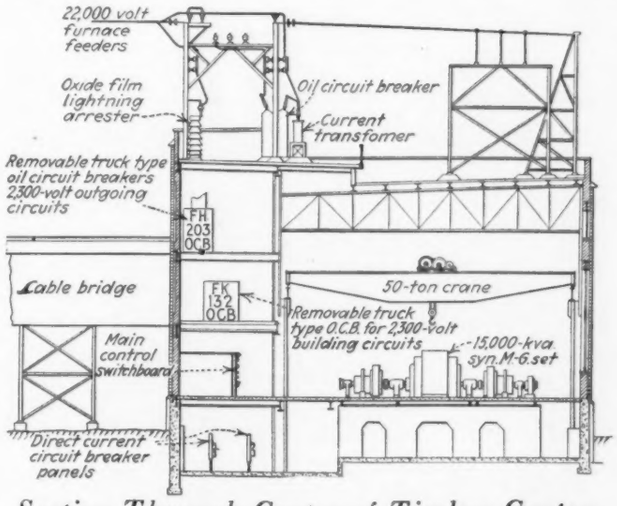
Serving a

45,000-Kw. Customer's Load

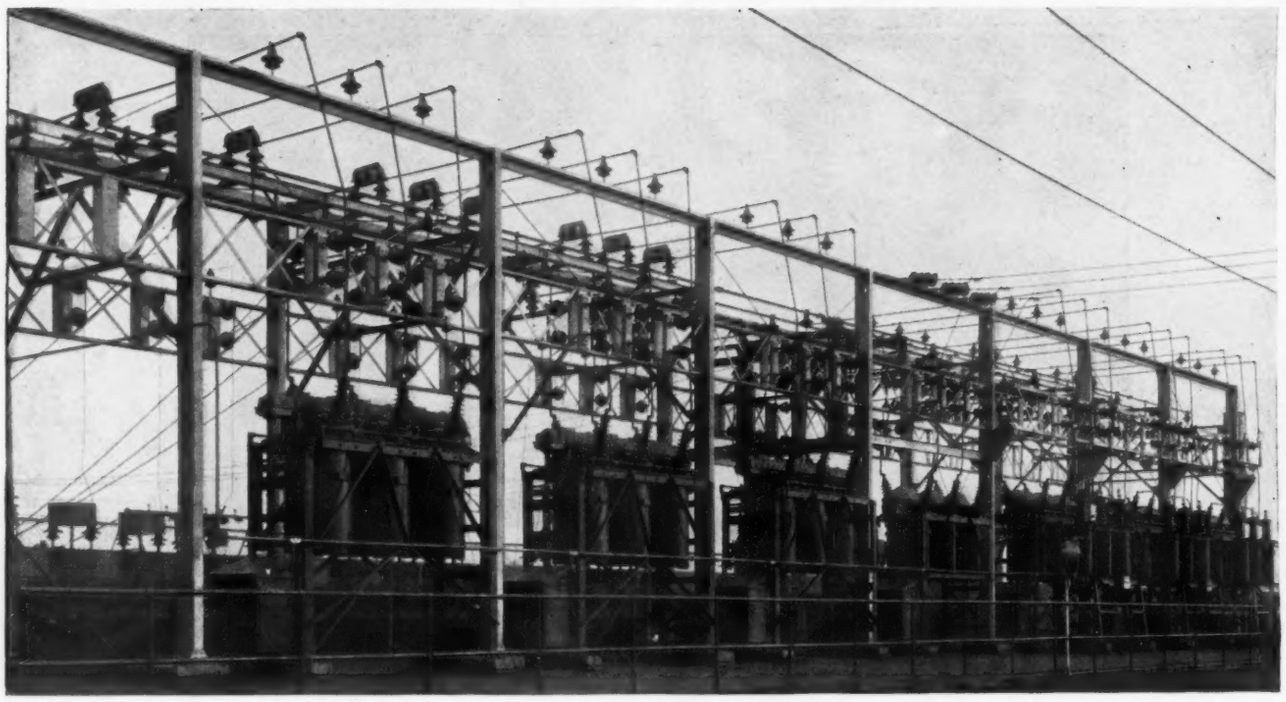
Four classes of service provided. Low power factor of induction motor and arc furnaces compensated by synchronous machines supplying direct current and driving air compressors

THE duty cycle on many of the larger motors and the high reactive current demand of a number of Herault arc furnaces in the Canton plant of the Timken Roller Bearing Company were not conducive to high power factor. Therefore, when the growth of the load had reached such a point as to require the building of a new substation it was decided to take advantage of the direct current and air compression load for the use of synchronous motor capacity with the result, now that the substation is in operation, that the power factor of the plant demand can be, and is, consistently maintained at unity.

The total load now on the substation divides itself into a direct-current motor and process load amounting to about 9,000 kw., alternating-current motor control and lighting load of approximately 12,000 kw. and an electric furnace load of 30,000 kw. maximum, of which about 5,000 kw. is furnished by resistance type and 25,000 kw. by arc type furnaces. In addition to this there are in the station itself about 1,800 kw. in synchronous motor capacity for driving air compressors. The substation is fed by three 22,000-volt lines from the system of the Ohio Power Company. As may be seen from the line drawing the power for both the Herault arc furnaces and annealing furnaces is supplied directly by four 20,000-volt lines from the supply bus direct to the furnace transformer. The remainder of the 45,000 kw. capacity of the station is accounted for by the bank of three 6,667 - kw. transformers which are located just outside the building. This diagram shows also the double 2,300-volt group buses which feed the air compressor motors. These two buses are capable of


22,000 volt furnace feeders
Oxide film lightning arrester
Oil circuit breaker
Current transformer
Removable truck type oil circuit breakers 2,300-volt outgoing circuits
FH 203 OCB
Cable bridge
FK 132 OCB
50-ton crane
Removable truck type O.C.B. for 2,300-volt building circuits
15,000-kva. syn. M-G set
Main control switchboard
Direct current circuit breaker panels

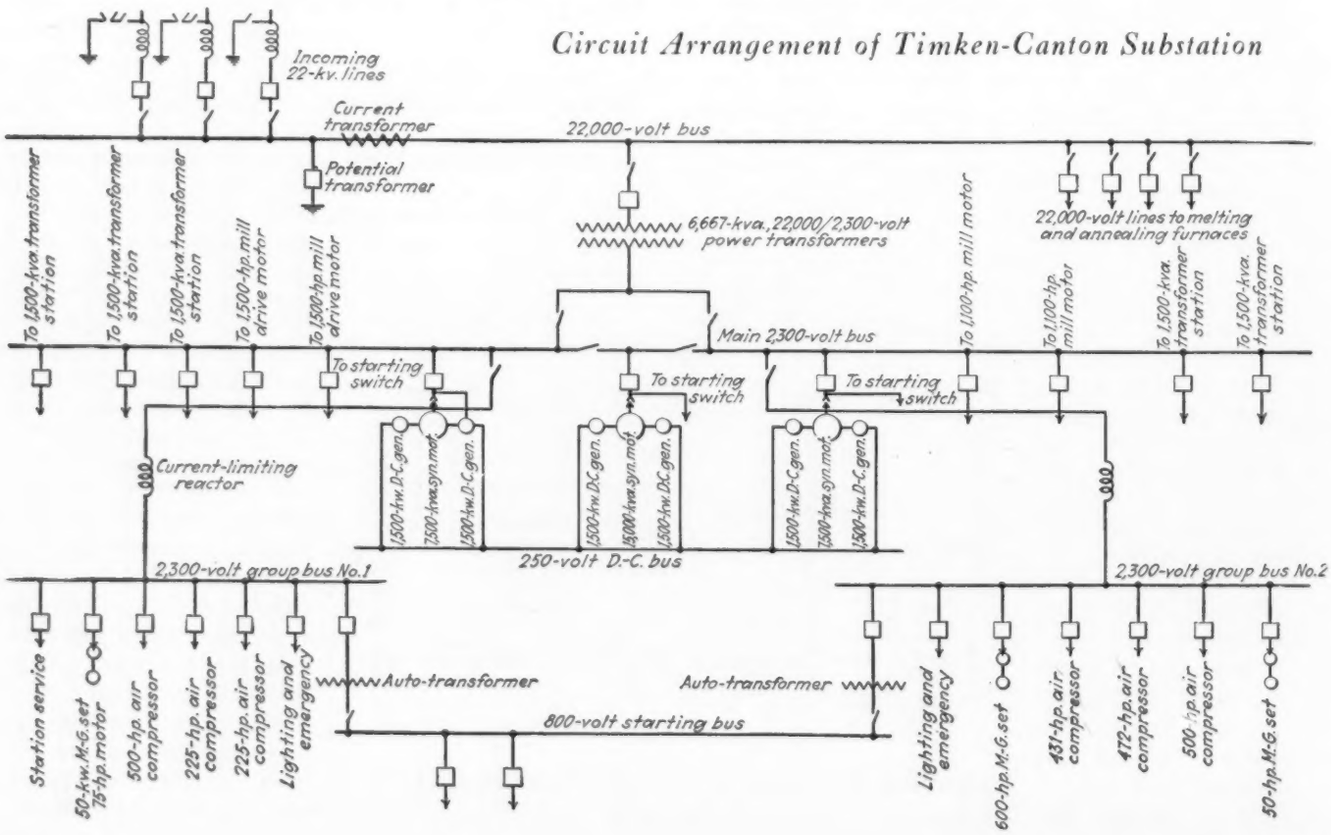
Section Through Center of Timken-Canton Substation



22,000-Volt Bus and Switch Structure on the Roof Serves Arc Furnaces

being connected together through the 800-volt motor starting bus, which is fed by auto-transformers from each one of the two group buses. The motor-generator sets are connected to the main 2,300-volt bus and are thus separate from the buses supplying the air compressor. Through the use of current-limiting reactors between the group buses and the main bus the possibility of trouble spreading from the compressor service to the main bus is largely obviated. The entire control of the station is remote, being actuated from switchboards located on the main floor. There are four such boards, one for the 22,000-volt circuit, one for the 2,300-volt main bus circuit, one for the two group buses and one for the direct-current circuits. The main floor is occupied by the synchronous motor-generators, the main control boards and six synchronous motor-driven

Circuit Arrangement of Timken-Canton Substation



air compressors. The switch galleries extend the entire length of the building on one side, the station control switches being located on the first gallery and the outgoing low-tension control switches on the second. These switches are all of the safety-inclosed, removable-truck type. The incoming 22,000-volt control and distribution switches are mounted on the roof of the station and the direct-current circuit breakers are located in the basement.

Considering the complications of the load to be supplied the station arrangement is quite simple. Full account has been taken in planning the layout for a continuous supply not only of power but of compressed air, which is one of the primary requirements here. The whole system is thoroughly protected against outages from overload or short circuits or other disturbances, but should these occur on any main line there is sufficient reserve equipment to render the delay only momentary.

Heat on a Quality Basis

Demand for uniformly high-grade product leads Los Angeles manufacturer of oil-well tools to install five electric heat-treating furnaces

By E. J. Cipperly

Industrial Heating Specialist
General Electric Company, Los Angeles, Calif.

THE demand for tools that would stand up in drilling oil wells deeper than heretofore considered possible led the Byron Jackson Company, Inc., Los Angeles, to search for improved methods of producing tools of the highest attainable quality with the least possibility of failure under the tremendous strains imposed when drilling to depths of 7,000 to 8,000 ft. Heat treating is considered a most important process in such work and the manufacturer, as well as the driller, fully realizes the importance of high quality tools, since the expense of a single failure causing a shutdown in drilling operations often costs many times the price of the tool.

Why Electric Heat Treating Is Used by One Manufacturer

Lower over-all cost.

Superior quality of tools.

Ability to maintain close automatic temperature control with a minimum variation throughout the furnace chamber.

Due to the nature of the heating cycle, equipment was necessary that by its impossibility of overheating the work would give maximum rate of heating with uniform results and high quality.

Owing to the limited space that could be given over to the heat-treating department, it was necessary to install furnaces that would give maximum production with a minimum of furnaces and floor space.

Low depreciation rate and maintenance cost as compared with fuel-fired furnaces.

Minimum scale on work.

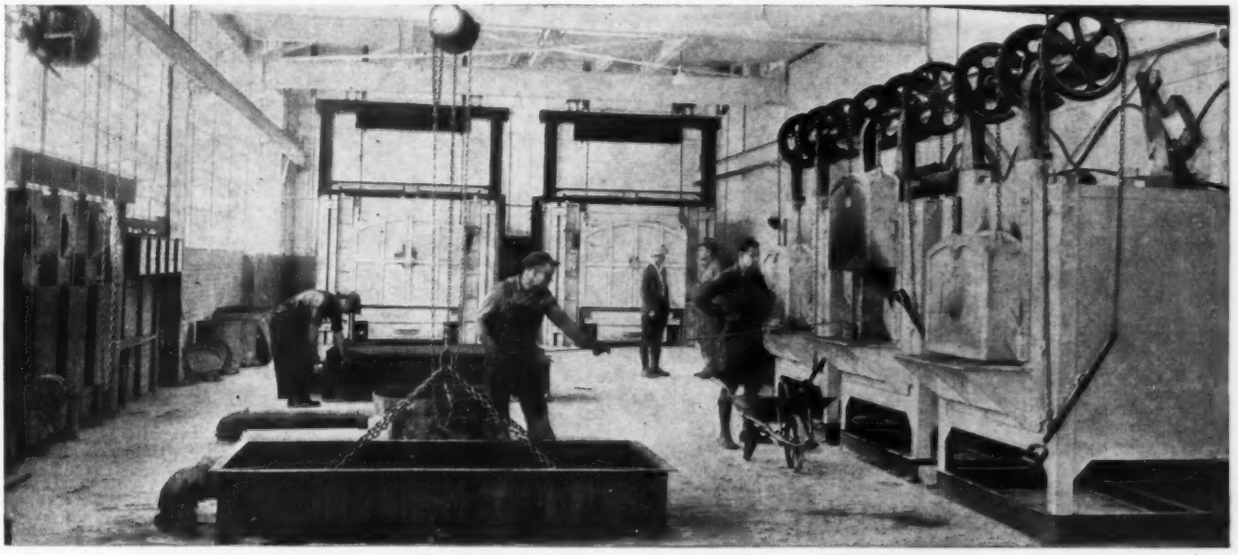
Better working conditions.

Reduced fire hazard.

Elimination of combustion fumes in working room.

A study of methods, types of heat-treating furnaces and fuels that would best meet exacting requirements, keeping in mind that the most important consideration was to produce the highest quality product and realizing that heat treating should be viewed as a part of the whole process and that a small saving in the cost of fuel was merely incidental, was undertaken. This study disclosed that because of the long heat cycle the actual cost for 24-hour carburizing would be less with electricity than with fuels.

Cost of operation was given considerable thought, since natural gas and oil are available in southern Cali-



Five Electric Furnaces for Treating Oil Well Tools

Three 45-kw. box type units are used for treating small parts. Two car type units operate on a 24-hour heat-treating cycle practically without attendance.

fornia in unlimited quantities and large users can obtain 1,100 B.t.u. gas for about 20 cents per 1,000 cu.ft. and oil at about $1.75 per barrel. Analysis of fuel costs further showed that electricity is likewise inexpensive and that current for electric furnaces could be had at a rate of approximately 1 cent per kilowatt-hour. With this low rate for electrical energy, together with the many advantages of electric heat treating, it was decided to install two furnaces of the car type and three box type furnaces.

Car Type Furnace Construction

Each of the car type furnaces has a connected load of 240 kw. and operates directly from a 220-volt, three-phase circuit. Heating units are of heavy nickel chromium ribbon 1¾ in. wide and about ⅛ in. thick, mounted on the roof of the furnace and on the car. Uniform temperature throughout the furnace is insured by increasing the number of elements at the door end and the rear wall to compensate for radiation losses. Doors are provided at one end only of the furnace and these have a sand seal to reduce heat losses to a minimum.

The useful area of the furnace is 10 ft. deep, 5 ft. wide and 30 in. high to the spring of the arch. Capacity of the furnace is 7,000 lb. of work, which can be heated to a temperature of 1,500 deg. F. in approximately four hours, although the holding capacity is several times greater than this. The temperature is automatically controlled and uniform throughout and as a safeguard against any failures in the automatic control a temperature limit fuse is provided that will melt and open the circuit. For these reasons the furnaces require little or no supervision after once charged and may be run throughout the night without an attendant.

In considering carburizing it must be remembered that this is an exceedingly long cycle, inasmuch as oil well tools must have a very thick base due to the extremely severe service to which they are put. One of the car type furnaces will in all probability be used almost entirely on carburizing work, so that a very accurate analysis can be made of results. The other furnace will be used for miscellaneous work, such as heating for annealing, and hardening and normalizing various sizes and kinds of tools.

In the carburizing process the weight of the work is relatively high as compared with the carburizing boxes. The boxes are of special alloy metal, light in construction, and during the short time the furnaces have been in operation the cost of carburizing has been found to be about 1 cent per 4½ lb. gross weight in the furnace, based on an average power cost of 1 cent per kilowatt-hour. When the furnace is used for heating work to be removed when at proper temperature and hardened by quenching a cost of 1 cent per 9 lb. of work heated will be realized. When forgings, of which there is a large tonnage per month, are annealed, a cost of approximately 1 cent per 5 lb. of work is considered economical.

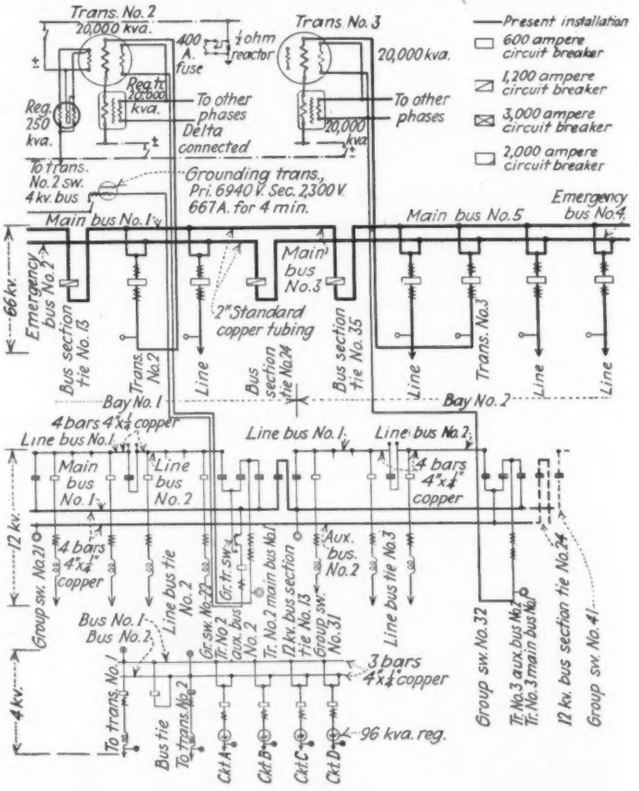
Box Type Furnaces for Small Parts

There are many miscellaneous parts of oil well tools that must be heat treated, and for such work three factory-built furnaces of the box type were installed. These furnaces have inside dimensions of 24 in. wide by 20½ in. high and 54 in. deep. Each has a connected load of 45 kw. and operates directly off a 220-volt, three-phase circuit. They will heat approximately 500 lb. of steel to a temperature of 1,500 deg. F. per hour. The maximum operating temperature is 1,850 deg. F. Standby losses are 8 cents per hour with energy at 1 cent per kilowatt-hour when the furnace is operating at 1,500 deg. F. and the operating economy is about 9 lb. of steel per kilowatt-hour.

The heating units, as in the car type furnace, are so arranged that additional heat is provided at the door and the rear of the furnace to supply radiation losses and maintain uniform temperature throughout the length of the furnaces. The heating units are of heavy nickel chromium ribbon, mounted on each side wall of the furnace and underneath the hearth, the hearth of the furnace being of high-grade alloy metal which will withstand a temperature of 1,850 deg. F.

The three box type furnaces and all equipment for the car type furnaces were supplied by the General Electric Company. Plans and equipment for the latter were furnished and the furnaces built on the ground.

Reliability Featured in Step-Down Supply Station



THIS simplified one-line diagram of the electrical layout at the new Washington Park bulk supply substation of the Commonwealth Edison Company illustrates the distinctive characteristics imposed by the duty for which it was designed. This station is the first of two intermediaries between the 66-kv. generating station trunks and the 12-kv. lines that feed the distribution substations. Because of its extreme importance in the system it is essential that this substation possess every characteristic of reliability and the switching, sectionalizing and other arrangements have been made with this element dominating. The transformers have double secondaries of 12 kv. and 4 kv. The lower voltage is used to supply distribution circuits in the vicinity. Both secondaries have regulating, tap-changing transformers which are separate units. The 66-kv. and 4 kv. systems are star-connected with neutrals grounded through resistors. The 12-kv. system, being delta-connected, has neutrals provided to the main and auxiliary buses through grounding transformers.

To Reduce Power Costs

Advocates maximum limit of 2,200 lb. at 1,000 deg. F. Forced circulation principle makes safe, simple and cheap power station. Utility point of view in station building

By Dr. St. Loeffler
Charlottenburg, Germany

THE economic advantages resulting from the generation of steam at high pressures and temperatures have been the cause of a rapid development of high-pressure steam operation in utility power stations during the last few years. Five years ago 290 lb. was considered high pressure. Today it would be unusual, at least in Germany, for a new central power plant to be constructed for an operating pressure of less than 1,100 lb., although there is considerable hesitancy on the part of central-station engineers to adopt pressures higher than 1,400 lb.

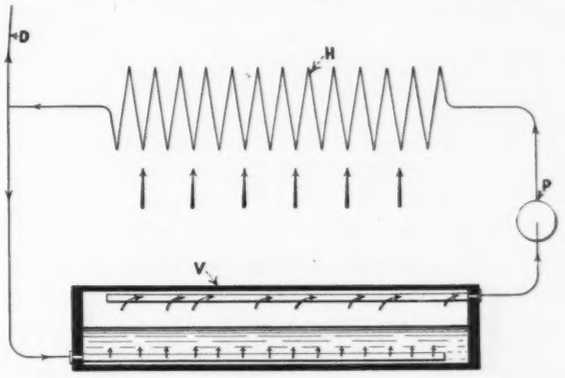
The economy of high-pressure operation is not due solely to the increase in steam pressure. The full benefits of the increased economy are secured only when the total temperature of the steam is correspondingly increased. Hitherto 750 deg. F. has been regarded as the limiting steam temperature, but this limit must be raised considerably if full advantage is to be taken of the possible savings with high pressures. Since most of the present-day high-pressure plants, especially in the United States, are operating at no higher temperatures than in low-pressure plants, it is not surprising that such high-pressure plants do not show greater economies than those operating at the lower pressures.

The cost of power generation in the United States has been substantially reduced by the construction of large plants and generating units of enormous capacity. Boiler units of 3,000 rated boiler horsepower and over and turbo-generators of 100,000 kw. capacity have been built and are in operation. This method of improving economy may lead to disastrous results, since the outage of a single unit would cut off a large amount of generating capacity. Costly reserve units of large capacity are necessary to take care of such emergencies. The danger of overextending this development must be guarded against and the requirement must be met that the load of a single boiler and of a single machine should always amount to only a fraction of the total load in the central station.

Pressure and Temperature Increases

Increasing the pressure and temperature differential of the boiler plant appears to be essentially more promising than increasing the size of units for improvement in boiler economy. Views on this subject have varied for a long time, and not so long ago well-known experts and builders of central-station plants maintained that increase of the steam pressure over 500 lb. brings about no economic advantages. However, in their considerations they have taken into account only the increase of the steam pressure, for further increase in the superheat seemed to them impossible because of the expected difficulties with materials, particularly in the superheaters and the turbine blades.

Furthermore, the hitherto existing conditions in steam boiler plants were not suited to infuse confidence in operators of central stations for increasing steam pressure. The character of feed water, the method of firing, the design and construction of the boiler, particularly the water circulation in which the uncovering of the heated steam-generating surface must be avoided, make the operation of older types of steam boilers uncertain under high-pressure operation. This uncontrollability and uncertainty of the older boilers has led to the development



The Loeffler Steam Generation System

The schematic sketch shows the essential principle of the forced steam circulation system of Dr. Loeffler. The superheater coils (*H*) are heated by fuel burning and the steam is forced through a closed circulating system by a pump (*P*). The heated steam vaporizes water contained in the unheated vaporizer (*V*) and the steam for prime mover operation is taken at *D*. The essential principle is the forced circulation of high pressure and high temperature steam through what might be called a superheater type of boiler.

of numerous new boiler constructions. The difficulties were more or less removed by varying the number, size and arrangement of boiler drums and the connecting tubes. Despite these design changes the managers of central-station plants are somewhat apprehensive in the use of high pressure.

However, in the last few years new steam-generating processes have been developed which are adapted to the special demands of high-pressure steam production, and particularly the control of the flow of the gases and of the heating effects in the boiler. Many articles have appeared in the literature on these processes, which have been tried out in part on a practical scale so that it is unnecessary to go into details on this subject here.

Use of New Process

Reports have been made in different journals and also in this publication regarding the high-pressure "steam circulation process" which was developed by me and my licensees since the year 1924.

It is particularly suited for pressures in excess of 1,500 lb. and temperatures up to 1,000 deg. F. in the steam and it makes possible the regulation of the production of the steam, of the flow of gases and of the pressures in all parts of the steam-generating installation, even when the load varies considerably and when changes occur in the method of firing or in the character of the feed water.

These favorable characteristics of the process have been substantiated by the results from operating plants. It has been shown that through the positive reversal of the flow of steam the operation of the boiler even at the maximum temperatures is simple, safe and easily controllable. The installations have been operated for many months with average superheat temperatures of 895 deg. F. to 970 deg. F. and pressures of 1,500 lb. to 1,800 lb. without any trouble. Even the tubes of the superheater, lying directly in the path of the coal dust flame, have shown no changes whatsoever, and according to experience up to the present time it may be safely assumed that the tubes of the superheater, made from hard open-hearth steel of 60 to 70 kg. per square millimeter breaking strength, would stand many years of operation before they would have to be changed.

It is of great importance that the system permits the use of hard steel in all parts of the plant, as hard steel is not affected by unfavorable conditions like the soft steel of the old boiler constructions. The welding of pipes into the ordinary boilers without relieving the stresses by later annealing causes an expansion of the material over the limit of permanent expansion. This is completely avoided in the construction of the new boiler.

Limits in Pressure and Temperature

For economical reasons steam pressure and superheat should be increased. The heat profit increases considerably up to a pressure of 1,900 lb., but over this amount the gain is little. The superheating temperature should be raised to a limit that is fixed by the endurance and cost of the materials used. One can use a temperature of 1,100 deg. F. in the tubes when using hard open-hearth steel. For this reason the highest temperature of steam employed, without using special steel, could be about 950 deg. F., in order to avoid alterations in the structure of the tube material.

When using the high-pressure forced circulation system the pressure and temperature can be controlled and regulated with safety, because the steam is forced through all parts of the system by means of a pump and thus can be regulated very simply. Every change of the fuel, water and load appears in a definite and visible manner. Even supposing that, by an unforeseen defect in the material, breaks or cracks should occur in the superheater tubes, the only thing that could happen would be the entrance of steam into the fire gas passages, which would immediately extinguish the fire.

The steam circulating pump necessary for the system has to overcome only small differences of pressure; at a pressure of 1,900 lb. this amounts to about 44 lb. Therefore, simple construction of the pump is possible and it must have only a small capacity for the work, about 2 per cent of the produced steam capacity. This pump is built for smaller boilers as a piston pump and for larger boilers as a circulating pump. If by any chance the pump should suddenly stop, the consequence can be only the gradual rise of the temperature of the walls of the superheater tubes, which causes an expansion of the tubes. This expansion makes possible the automatic opening of a valve through which the steam is released and the fire extinguished. By this means the steam circulation in the superheater tubes is assured and the burning of the tubes is made impossible. The amount of energy necessary for the operation of the pump is small, especially if the pump is driven by steam taken from a low-pressure installation, because the remaining heat of this steam can be used for heating the feed water.

Any change in the load is without much influence on the amount of superheat; it is nearly constant for all variations of the load. Even in the event of a sudden stop of the prime mover the superheater is not in danger because the steam circulation pump continues to work. A sudden demand for more steam can be filled immediately by drawing superheated steam from the large volume of circulating steam.

The forced steam circulation process, particularly if used with powdered coal combustion, permits one getting another boiler on the line in about ten to twenty minutes at high pressure. The evaporators of boilers which are not in use can be kept filled with water at saturated steam temperature, so that another boiler can be started quickly by circulating high-pressure steam. Water scale can settle with this system only in the unheated steam evaporators, from where it can be removed from time to time during the operation of the plant, as it appears only in the form of slime. It is, therefore, not necessary to stop the boiler for the purpose of cleaning and feed water. Distillation plants are unnecessary.

Conclusions

The facts and opinions to be considered by a utility manager either in extending his old plant or in building a new one can be summed up as follows:

1. The steam pressure should be raised to a maximum of 2,200 lb. with a superheat temperature of about 1,000 deg. F. in the steam generator or boiler.
2. The operation of the steam plant should be easily controlled and regulated in all parts, so that complete safety is assured.
3. The steam generator should not be sensitive to the quality of fuel or water or to the fluctuations of the load.
4. The steam generator should respond immediately to all fluctuations of the load without making special steam or water accumulators necessary.
5. Stresses in the material should not increase in any part of the steam generator, influenced by fire, over the values developed by the pressure and temperature of the steam. The normal transfer of heat, dependent on the condition of the flowing water or steam, should not change because of scale or for any other reasons.
6. High-pressure steam generators must be safer than low-pressure boilers. Even in the case of a failure in a boiler part no dangerous consequences should occur.
7. The steam generator must be made from materials which are not altered because of operation at high pressure and temperature. These must be cheap, and therefore hard open-hearth steel is used wherever possible.
8. The steam generators must be tested before practical operation at a pressure about twice as high as that demanded in actual operation without showing defects or leakage.
9. The steam generator must be started or stopped in the shortest time and it must permit quick regulation in order to make reserve machines unnecessary.
10. The high-pressure generator must be simple and require minimum skill in operation.

Concentrating Power

LARGE steam turbines have replaced hundreds of old reciprocating engines and are being substituted for the smaller turbines of former years in electric light and power plants in the United States. The average rating of prime movers is rapidly increasing. Internal combustion engines comprise 1.5 per cent of the total horsepower. The ratio between steam, water and internal combustion engines is hardly changing, the increase in water power not quite keeping pace with the others. Concentration is proceeding so rapidly that in 1927 three times the horsepower of 1917 required fewer prime movers and fewer generating stations.

The accompanying table, compiled from earlier reports of the electric light and power census and the recently published preliminary figures for the census of 1927, summarizes the data for the past five census years.

Prime Movers in Electric Light and Power Plants in the United States

From 1917 Census for 1907, 1912, 1917
From Bulletin of March 30, 1929, for 1922 and 1927

Steam Engines				Waterwheels and Turbines			
Year	Number	Horsepower	Average Horsepower	Year	Number	Horsepower	Average Horsepower
1907	7,677	1,875,863	245	1907	2,481	1,349,087	543
1912	6,813	1,895,382	278	1912	2,939	2,469,231	840
1917	5,788	1,701,677	293	1917	3,374	4,277,273	1,265
1922	4,175	1,371,296	328	1922	3,481	5,822,018	1,673
1927	2,264	1,054,922	466	1927	3,719	9,834,963	2,650
Steam Turbines				**Total Prime Movers**			
1907	377	817,410	2,170	1907	10,998	4,098,188	373
1912	1,034	3,054,396	2,955	1912	11,902	7,530,044	632
1917	1,699	6,747,399	3,970	1917	13,795	12,936,755	937
1922	2,330	12,354,551	5,300	1922	13,242	19,850,860	1,500
1927	2,852	24,187,470	8,480	1927	12,007	35,622,593	2,970
Internal Combustion Engines				**Number of Generating Stations and Average Rating**			
				Year	Number		Average Horsepower
1907	463	55,828	120	1907	4,714		870
1912	1,116	111,035	100	1912	5,221		1,440
1917	2,934	210,406	72	1917	6,542		1,980
1922	3,256	302,995	93	1922	5,444		3,650
1927	3,172	545,283	172	1927	4,387		8,210

More than 8 Milliamperes Causes Serious Discomfort

By F. M. Farmer
Chief Engineer Electrical Testing Laboratories

NO INSULATION that can be interposed between a workman and a live circuit can be so high that no current whatever will flow through him. The current will be greatly affected by other factors than the gloves. Therefore, how much current* may be permitted without being hazardous?

The most conservative value is the maximum current that will not cause an involuntary muscular reaction which, while perfectly harmless in itself, might cause a sudden involuntary movement resulting in an injury. A recent investigation of the amount of 60-cycle current which will produce mild shock disclosed that the average of the currents at which 42 men first observed the sensation of shock on sudden contact with 1.2 milliamperes and the average of the maximum currents which the men could withstand without serious discomfort was 8.0 milliamperes. In actual use the amount of current which will flow will depend upon the area and condition of contact between the glove and the "live" circuit and that between the glove and the wearer's hand. Certainly the standard test condition under which gloves are tested (i.e., gloves filled with water and immersed in water) allows at least two to three times as much current to flow as any condition which would be encountered in use. Therefore, the standard limit of 1 milliampere per 1,000 volts under the test condition would seem to be conservatively safe.

*Prepared at request of National Safety Council.

The Industrial Development Job

THE duties of the industrial development department of an electric utility were summarized by George C. Heisterman of the Public Service Company of Northern Illinois to the recent Iowa Power and Industrial Conference as follows:

(a) To study the natural and industrial resources of the company's territory and be familiar with the factors involved in factory location.

(b) To study the utilization of agricultural products in industry and be familiar with the raw material supply, methods of conversion and ultimate use or consumption of such products.

(c) To encourage and assist communities in formulating and carrying out definite industrial and agricultural development programs.

(d) To supply manufacturers with data needed by them in deciding on the location of plants.

(e) To assist in removing obstacles in the way of expansion of present industries and to stimulate the development of new industries, large or small.

(f) To co-operate with the various sales departments in selling the company's service to manufacturers.

(g) To maintain contact with other bodies interested in the industrial expansion of the territory and exchange information of mutual interest with them.

(h) To promote reciprocal buying between the company and industries located in its territory and among the industries themselves.

It is obvious that the personnel of the department must grow with increased activities and care should be exercised to secure men of proper training and mature judgment who can perform efficiently in their particular field. In contemplation of the problems encountered an industrial development department which will operate efficiently can be set up with four men as follows:

(a) An industrial development engineer who has had actual training and experience in large and small industrial plants, supplemented by power or industrial gas engineering experience in a utility company. He should direct the functioning of the department, formulate its policies and deal personally with the major problems involved in plant location.

(b) A chemical engineer whose industrial experience and commercial acumen fit him to study the natural and industrial resources of the territory, keep in touch with industrial and agricultural research and work enthusiastically on specific problems which require this type of training.

(c) A graduate engineer who shall devote his time to field work in connection with surveys and the listing of industrial properties as well as to keeping up to date records and statistics applying to industrial prospects, industrial property and community surveys.

(d) A commercial man who shall assist communities to formulate definite industrial and agricultural programs, prepare advertising and other publicity for the use of the department, analyze the reciprocal purchasing possibilities in the territory and assist in the preparation of data which are of a commercial rather than a technical nature.

In addition each member of the organization shall take every opportunity to make and maintain contact with other bodies or individuals who are interested in the industrial expansion of the territory, as well as other areas.

Rigid Maintenance Reduces

By C. E. HEATH
Superintendent of Transmission
Southern California Edison Company,
Los Angeles, Calif.

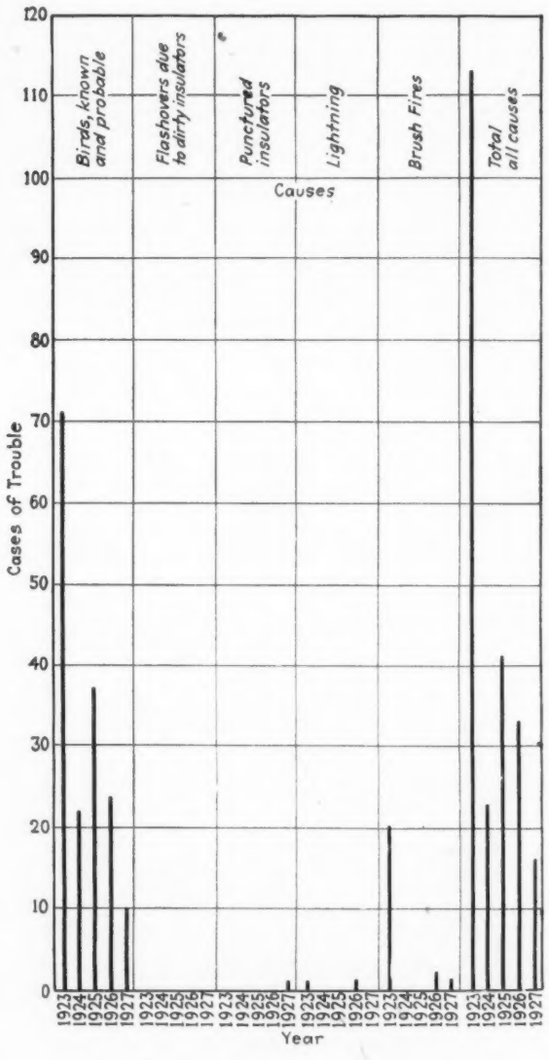
ONE of the most interesting chapters in the history of the Southern California Edison Company would cover the growth and extension of its transmission system from the time when its first pole line was built in 1893 to transmit 400 kw. at 10,000 volts from Mill Creek to Redlands, a distance of 8 miles, down to the present time, with its network of lines supplying 500,000 kw. to 400,000 consumers in ten counties of southern California and transmitting energy at 220,000 volts for 300 miles. However, the purpose of this article is not to tell the story of growth, but to give a brief outline of the system as it exists today and of the organization that builds the lines, inspects and patrols them after they are put in operation and repairs and restores them to service when trouble occurs. Also, to give a summary of the causes of line trouble during the past five years and explain what has been done to eliminate or reduce these causes to a minimum.

Today the transmission system consists of

771	miles of	220-kv. single-circuit tower line
10	miles of	220-kv. double-circuit tower line
95	miles of	66-kv. single-circuit tower line
225	miles of	66-kv. double-circuit tower line
15	miles of	66-kv. multi-circuit tower line
1,208	miles of	66-kv. single- and double-circuit wood pole line
85	miles of	33-kv. single- and double-circuit wood pole line
A total of 791	circuit miles of	220-kv. line
1,943	circuit miles of	66-kv. line
94	circuit miles of	33-kv. line

The transmission organization at present, aside from the necessary clerical force for office, accounting and recording, is as follows: Eight heavy gangs of ten to twelve men each on construction work, under supervision of a general foreman; 43 patrol crews of two men each, under supervision of seven chief patrolmen. Each chief is centrally and permanently located as to the territory covered and has direct charge of from four to seven crews.

The chief patrolmen report to a patrol supervisor and the superintendent of transmission located at Los Angeles. In addition to this, a crew of ten or twelve men is kept busy seven months of the year cleaning insulators and extra crews are put on from time to time for special work. Each patrolman maintains from 8 to 100 miles of transmission line, depending on accessibility and type of



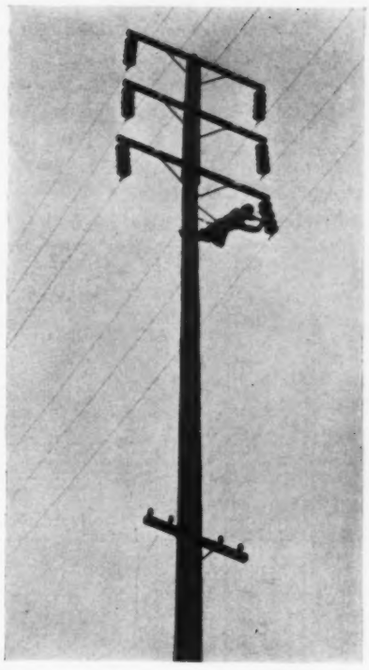
Five-Year Trouble Chart for 150- and 220-Kv. Lines

The 150-kv. lines were changed over to 220-kv. in May, 1923.

Transmission Troubles

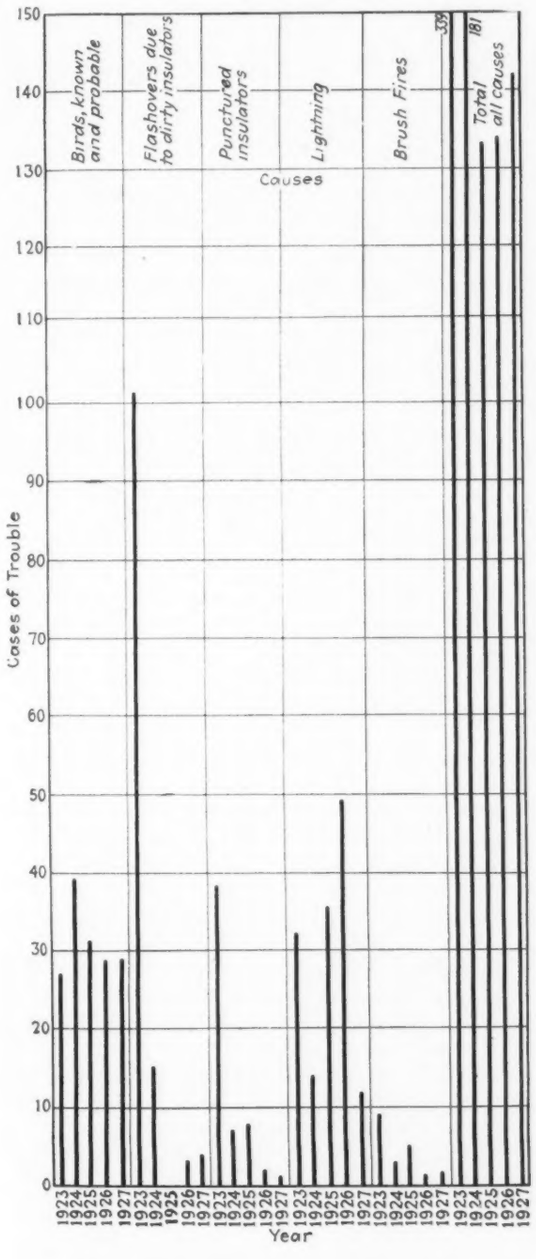
Flashovers and outages reduced from 464 cases in 1923 to 129 cases on 2,828 circuit miles of line in 1927 as result of careful maintenance work

construction, and about an equal number of miles of telephone line. O.K.'s to work on transmission lines are issued by the load dispatcher to patrolmen only, and wherever work is being done on operating lines he must be there to receive the O.K. and clear the line when it is again ready for service. A regular weekly inspection of all lines is required.



Cleaning Insulators on Southern California Edison Lines

One of the main functions, in fact the principal reason for the existence of the patrol organization, is to maintain the transmission lines in such condition that short circuits will not occur. To prevent a "short" means a saving of perhaps thousands of dollars in repairs and minutes of outage or low voltage that sometimes affect the whole system and entail inconvenience and loss to thousands of consumers. To cause a "short" carelessly is almost inexcusable. When one does occur the patrolman's job is to determine the cause and repair the line as quickly as possible.



Five-Year Trouble Chart for 33- and 66-Kv. Lines

Causes of Trouble

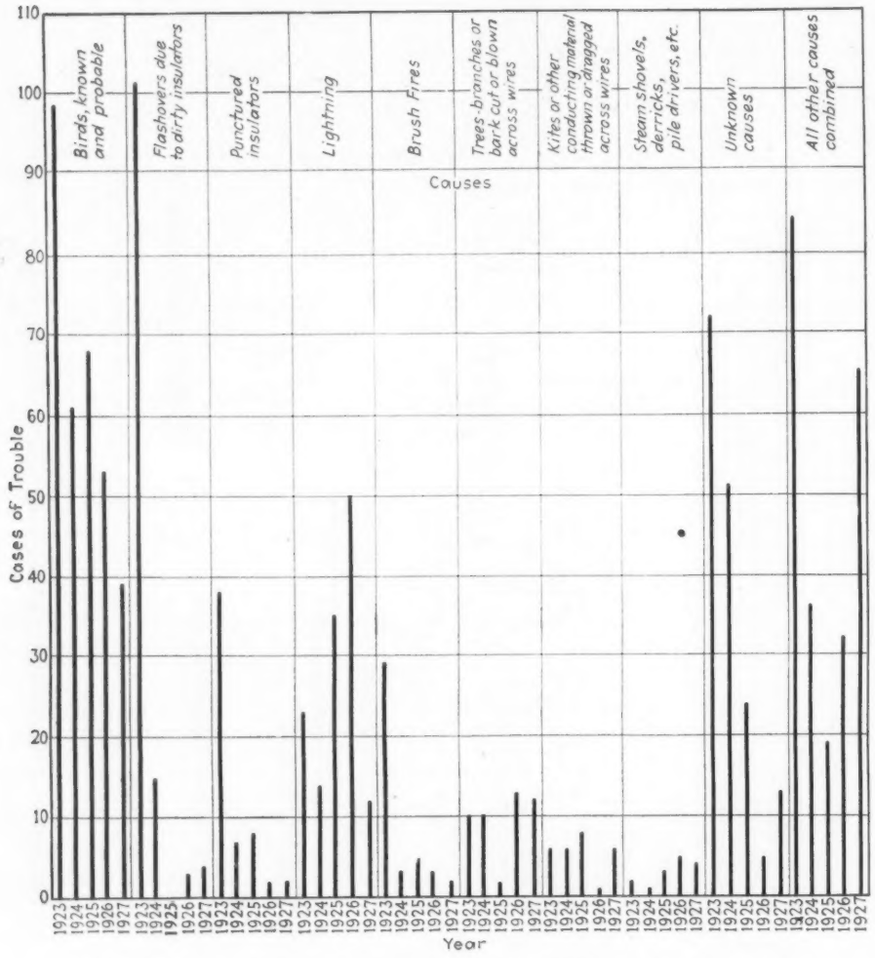
In the summer of 1923 the transmission department of the Edison company faced a serious problem. Line "shorts" were occurring with such frequency that the reputation of the company for good service was at stake. During June and July of that year 60 flashovers occurred on the 66-kv. lines and nineteen on the 220-kv. lines, the causes of which were not definitely known at that time. Various explanations of the cause of the 220-kv. line flashovers were entertained by company engineers, but the one advanced by G. H. Stockbridge, transmission engineer, and which proved to be correct, was simply birds. He contended that if birds could be kept off the towers 98 per cent of the trouble would be eliminated. Although skeptical of results, the management appropriated the money to carry out a program of protection. It took two years to control the birds, but it was done, and a flashover on the 220-kv. lines is now a rare occurrence.

An interesting article in the Dec. 26, 1925, number of Electrical World by G. H. Stockbridge tells how this was done. The control of birds on the 66-kv. double-circuit towers has not yet been fully accomplished, due to insufficient space between crossarms.

On 239 towers of a certain 66-kv. line trouble caused by sleet during the winter and birds in all seasons of the year were of such frequent occurrence that in 1926 an appropriation was made to increase the crossarm spacing from 6 ft. to 12½ ft. This has apparently stopped the trouble, for no "shorts" due to these causes have occurred since. All 66-kv. double-circuit towers are equipped with bird guards made from hardware cloth and fashioned and

installed in a way that makes it difficult for a bird to perch directly over the insulator strings. This has greatly reduced the number of "shorts," but an occasional one occurs, caused by a large bird making contact between the conductor and crossarm.

Flashovers on wood pole lines was another problem, which, like many others, was very simple after it was solved. At that time the standard 66-kv. insulation was



Five-Year Trouble Chart for All Transmission Lines on Southern California Edison System

five units on dead-ends and four on suspension with double suspension strings at all crossings of highways, trolley and railway lines, toll leads, etc. Grounded steel crossarms were used on wood pole line dead-ends. It was observed that about 75 per cent of the flashovers were on double suspension strings and that all units on these strings were very dirty. On some strings the petticoat grooves were half filled with accumulated dust, packed hard. It was also noticed that these flashovers happened during a heavy fog or light rain.

It was decided that three things should be done: (1) That a fog belt should be established and that within the area subject to fog one unit should be added to all suspension strings; (2) that double suspension strings should be eliminated, as it appeared they were a hazard rather than a safeguard; (3) that all insulator units in the fog belt should be cleaned at least once a year.

All this has been done and the number of flashovers on 66-kv. lines due to causes other than birds have diminished from 101 in 1923 to 15 in 1924, none in 1925 three in 1926, four in 1927 and two up to Oct. 1, 1928.

Cleaning insulators is now recognized as one of the most essential items of line maintenance. After experimenting with several methods of cleaning, the practice now is to clean them in place with steel wool and rags. As previously stated, a crew of six or seven linemen is kept on this work continually during the seven months of the dry season, the heavy rains of the winter months keeping the insulators fairly clean. Old type insulators that have been in service several years are "Meggered" and bad ones changed by the gang during the cleaning. The records show that 2 per cent of these are found defective each year. The accompanying table gives a summary of the extent and cost of this work for 1925, 1926 and 1927.

When cleaning only is done the cost per pole is about 30 per cent less. That is to say, the proportional cost of cleaning and "Meggering" to cleaning only is 70 to 30. No. 2 steel wool is used and the amount required averages 3 lb. per 1,000 units. The total line outage involved in this work, if it could be expressed in dollars, would be considerable. In 1926 it amounted to approximately 1,860 hours and in 1927 to 2,750 hours. It is very apparent, therefore, that if a device could be made with which line insulators could be safely and effectively cleaned on energized lines it would mean a saving of thousands of dollars to the power companies.

A study of the attached trouble charts shows that next to birds and insulator trouble, which have been controlled, lightning is the greatest menace to the company's transmission lines. A campaign is now on for the elimination of lightning troubles. The danger from windstorms and floods is being reduced to a minimum by rebuilding old lines and using the best both in construction methods and material.

Boys flying kites and throwing wire cost the Edison company thousands of dollars' damage each year. Steam shovels, pile drivers and derricks continue to "short" lines in spite of constant vigilance on the part of patrolmen. Automobiles and trucks collide with poles and now a new menace is the airplane.

Transmission line troubles are many and varied, but the accompanying charts prove that while the yearly line mileage is increasing, the number of interruptions due to line trouble is decreasing.

Data on Cleaning and "Meggering" Insulators on 66-Kv. Lines for Three-Year Period

	1925	1926	1927
Number of poles and towers worked on	12,774	14,252	18,573
Number of units cleaned	217,139	266,566	303,434
Number of units changed	2,653	2,416	4,299
Labor cost	$25,353.40	$22,256.81	$28,160.54
Transportation cost	$4,476.24	$4,369.20	$4,419.78
Total cost—except insulators	$30,617.27	$27,199.99	$35,052.00
Average cost per structure	$2.40	$1.98	$1.89
Average cost per unit	$0.141	$0.102	$0.115
Average cost on wood poles to "Megger" and clean per unit			$0.08
Average cost on steel towers to "Megger" and clean per unit			$0.14

An Industry Move to
Stimulate Better Appliances

Association of Edison Illuminating Companies to encourage a higher grade of domestic equipment sponsors program for constructive analysis of present devices with recommendation plan in view

A DEFINITE program for the improvement of domestic appliances through encouragement of the use of those of superior quality has been adopted by the Association of Edison Illuminating Companies. This action was induced by the knowledge that electrical equipment offered for sale to the public frequently lacks characteristics needed for satisfactory service and by the necessity of customers having some basis for intelligently selecting their electrical equipment. It was decided that the quality improvement program should be brought under the auspices of a committee whose personnel would give evidence of the serious intent of the association to deal with this difficult problem along constructive lines. The committee includes Chairman W. H. Taylor, president of the Philadelphia Electric Company; Alex Dow, president of the Detroit Edison Company; Samuel Ferguson, president of the Hartford Electric Light Company; John F. Gilchrist, vice-president of the Commonwealth Edison Company; M. S. Sloan, president of the New York Edison and allied companies, and Thomas N. McCarter, president of the Public Service Electric & Gas Company. The technical and testing problems involved have been intrusted to Electrical Testing Laboratories. This organization will proceed along lines approved by the appliance committee.

The project, according to executives of the Edison Association, is intended to be applied ultimately to everything that goes into the modern home with the intention that it should be electrically energized. The general plan includes the organization of records of repair and servicing departments of central-station member companies of the association in order to permit of analyses which will indicate where the greatest need for improvement is to be found. With the guidance thus provided, it is proposed to survey those types of equipment which most generally occasion dissatisfaction in service and to secure the facts of quality and performance. It is proposed to submit to each manufacturer any facts indicating inferiority or deficiency of his product that may help him, if he desires, to bring about its improvement. It is proposed in due course to provide member companies of the association with information with the aid of which they may select for sale and recommend to their public equipment which is known to be capable of giving satisfactory service. This will involve formal or informal grading of equipment with regard to quality; this, it is believed, can be accomplished with the aid of organized laboratory tests and organized service experience which the association is in a position to secure.

"If we are to conform with the ideal of the best electric service at lowest cost to the public which we serve, we must take an interest in appliances and do all in our power to encourage the manufacturers of those which will give satisfactory service."

—H. P. LIVERSIDGE,
President Association of Edison Illuminating Companies

For the purposes of this program it is as important, in the opinion of the association, to determine which devices have desirable qualities and a high degree of excellence as it is to point out those which are inferior. Service experience having indicated the need, initial efforts are being directed toward the improvement of appliance plugs and cords. When this activity shall have attained full momentum it is proposed to undertake like activity with regard to electric flat-irons. Beyond this the order in which appliances will be studied has not yet been decided upon, except that the appliance committee from time to time may direct Electrical Testing Laboratories to make investigations of types or brands of appliances concerning the qualities of which member companies may desire information.

In general, it is the definite intention of the association to be helpful and constructive. It desires to co-operate with all electrical manufacturers who are seeking to make products of good quality to the end that the public may be well served and electric service may gain and hold that complete confidence on the part of the public which it is capable of achieving through the co-operation of all progressive elements of the industry.

The movement is well under way, Electrical Testing Laboratories having entered actively into development work on testing equipment which will bring out the facts with regard to actual performance under service conditions. The first devices to be tested are heater cords and plugs, since these have been found to give the most trouble.

"Our plans call for the supply of basic information of performance of electrical equipment and appliances," said Preston S. Millar, general manager of Electrical Testing Laboratories, in discussing this work. "We are proceeding upon the basis that if the facts of quality and performance are known, the industry will guide itself constructively. Essentially, the project calls for communication privately to manufacturers of the facts regarding any weakness or defect disclosed by tests of their products; for encouragement of the manufacturer to correct such weaknesses, and for report to the central stations, which are supporting this work, all the facts concerning the qualities of the better grades of equipment and appliances. It will then devolve upon these central stations to employ the information thus made available for the improvement of service in their several communities, through the use by customers of equipment which will be thoroughly satisfactory.

"Under the tentative plan now in effect several utility

companies, members of the Edison Association, have nominated contact men who have been invited to offer criticisms, advice or suggestions in carrying out these tests. Several of the larger central stations are also co-operating in keeping records of their appliance servicing and a special form for the compilation of such service data as may be readily co-ordinated has been prepared. This procedure makes available a profitable source of information of which the best use has not been made heretofore.

"We want and need the co-operation of the manufacturers and will, for each type of device, submit an outline of the tests proposed for their supplementary suggestions or comments. The idea, fundamental and basic, is that the determination of facts will enable those interested to raise the level of quality of the entire market. Any improvement that can thus be brought about will react to the advantage of the public and should be of assistance to any manufacturer who is intent upon supplying satisfactory equipment.

"The final application of the data we are compiling will probably not be an approval or a certificate of compliance, but will be a grading of relative quality which will indicate just how each product stands with relation to the rest of the market. Various factors will be included and advantages of each considered, so that the total will be a summation of weighted ratings. It will then be practicable to decide what percentage rating is to be adopted for any given class of service."

Half of Workers Hindered by Poor Seeing Conditions

Says LEWIS H. CARRISS*

"ONE out of every two workmen cannot see clearly what he is doing.

"Thousands of cases of seriously defective vision among working men and women could be prevented by remedying faulty illumination in industry.

"No person can do his work efficiently unless he can see clearly and comfortably.

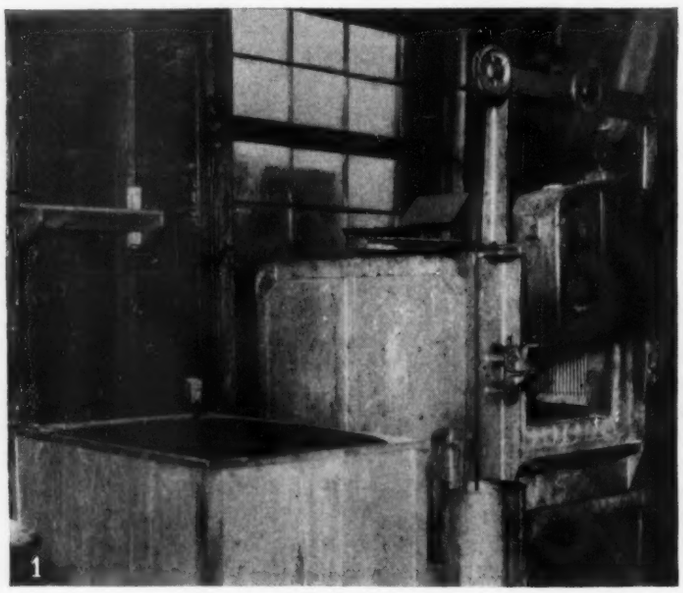
"Plans for the natural and artificial lighting of any place of work should take into account: Arrangement of windows and skylights for maximum natural light; arrangement of desks, machines and workbenches so that employees do not face windows; avoidance of shadows, especially at the operating points of machines; selection of a lighting system and equipment requiring a minimum of local lights; illumination for out-of-the way corners where valves, switches, stairs, etc., are located, and facilities for cleaning lights and reflectors with a minimum of inconvenience or accident hazard."

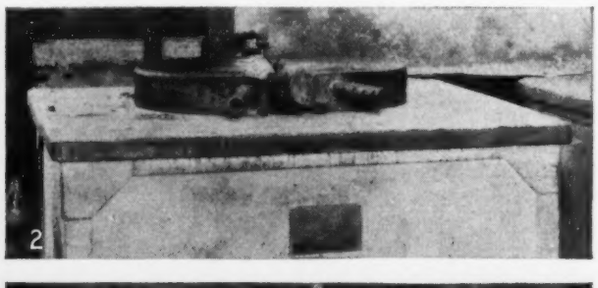
**Managing Director National Society for the Prevention of Blindness.*

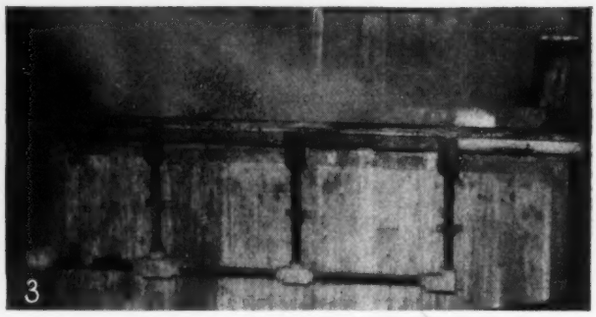
Economy of Electric Heat

THE single factor of economy was the reason for the use of electricity for all heat applications in the plant of the Bog Manufacturing Company, Chicago. The heating load in this plant is over 100 kw. and power requirements bring the total up to 200 kw. But the diversity factor is high and the actual demand amounts to only 46 kw. The monthly consumption of 12,000 kw.-hr. from the Commonwealth Edison Company shows that the load factor is also high, about 35 per cent.

The demand would be lower and the load factor higher if the customer did not have an off-peak clause in his contract. As it is, the off-peak clause permits him to earn a low rate and makes electric heat desirable on a price basis alone.







Electrically Heated Furnaces, Case Hardening Units and Cleansers

No. 1. A 20-kw. furnace for heat-treating dies and machine tools. Alongside is the quenching and drawing oil bath heated with a 14-kw. unit.

No. 2. One of two 20-kw. furnaces used for case hardening. With flame heat the cyanide pots were good for about a week; with electric heat they have lasted over a year and are still serviceable.

No. 3. Six 5-kw. immersion units heat this bath in which products to be plated are cleansed of oil and grease before heat treating.

Changing Conditions in
Customer Ownership*

Factors contributing to resale of preferred stocks. Influence of demand for common or participating shares on customer holdings. Profitable "trading out" not detrimental to public relations

By HAROLD EDWARDS
Old Colony Corporation, Boston, Mass.

CONDITIONS in many departments of the public utility industry are changing in important ways. To a lighting business has been added a tremendous expansion in power consumption with large and small customers. Later, in place of campaigns for more customers through house-wiring activities, we find campaigns for more consumption per customer. In place of an insistence on financing primarily through first mortgage bonds we find at the moment junior securities of many sorts and kinds receiving more and more consideration.

There are fundamental differences in the local conditions and local problems of different properties, so that one may truthfully say that food for one is poison for another. For example, the threat of municipal competition here and there twists our rate structures and many sound policies out of shape. Electrifying the farm, giving outlying districts the convenience of electric cooking, the competition between electricity and gas in cooking and refrigeration, the character of the institutional investment market, all vary over wide extremes through different sections of the country.

CREATIVE MARKET ESTABLISHED

Your customer-ownership movement has demonstrated its outstanding importance on the basis of actual accomplishments. Since the movement was started upward of 2,000,000 individual sales have been made, or approximately ten sales per 100 of the 20,000,000 present customers. During the last year or two the number of sales has averaged very roughly 1 per cent of the total number of customers. This suggests very large possibilities for further growth even if some other forms of investment introduce new types of securities for your customers.

This movement has brought into the industry very large amounts of money, much of which would not otherwise have been obtained. You have done the investment market a most valuable service by introducing public utility securities as a source of investment to many individuals who would have been reached with great difficulty, if at all, by the regular investment bankers.

Having educated these new investors, or, rather, introduced them to the security market, you have undoubtedly provided a new market of definite importance to the investment banking world.

Most important of all, from your point of view, the customer-ownership movement has been of pronounced value in building up favorable public relations.

There are a few statistics, in addition to those given, which merit considerable thought. The proportion of funds furnished by customer ownership, out of the total new funds in any one year, reached a high point of 23 per cent in 1925. Each succeeding year has shown a lower proportion, namely, 17 per cent in 1926, 12 per cent in 1927 and 11 per cent in 1928. I have asked a number of executives about this decrease in the proportion of funds coming to the industry through customer ownership. Various explanations are given:

First—The state of the money market—a cloudy and misty expression.

Second—The lack of interest in customer ownership on the part of many other executives, i.e., blame the other fellows.

Third—The oversale and consequent unbalancing of the capital structure in earlier years, followed by the necessary improvement in the financial set-up.

Fourth—The anxiety for lower cost money through bonds.

Fifth—The demand in the market for common stocks, "A" stocks and investment trust securities.

As I see it, the opinions received have confused the situation more than they have illuminated it. In any case, it is not a simple task to clear up the question why a smaller and smaller portion of public utility financing is being done by way of customer-owned preferred stock.

In order to get definite information on various phases of customer ownership from men in the field I have written to several acquaintances among the operating companies. Two companies out of eight concede that their securities have gone off in price during the past year. In both cases these securities had been listed on two of the rather important stock exchanges as a method of handling the resale problem, the so-called secondary market.

The refunding of customer-ownership securities into new issues with lower dividend rates is in every way acknowledged to be very well loaded with difficulties. With one exception the opinion is given that such refunding is to be avoided on account of its possible adverse effect on public relations. I have come across only one case where customer-owned preferred issues have been refunded into lower rate issues, and that produced a reduction of nearly one-fifth in the number of preferred-stock-holding customers.

In the majority of these cases no serious competition has been attributed to common stocks and other forms of investments. However, one utility out of eight

*From an address before the New England Division, N.E.L.A.

reported difficulty in maintaining a market through the recent enthusiasm for common stocks. The 6 per cent return from building and loan companies had also given troublesome competition for customer-owned preferred. Another utility selling a 5 per cent preferred issue had discovered some competition from the 4½ per cent rate of savings banks and also had felt this competition of building and loan associations.

Two companies found more stability and less "trading out" in villages and small towns, while one utility found a more stable market in the large city.

Relations with the Investment Bankers

It has been customary, as I understand it, to emphasize very strongly the importance of distributing customer-ownership stock through a special organization directed by the public utility officials. The investment banker has been occupying a less and less prominent part in the program.

However, I find the president of a public utility in one of the large cities of the Middle West laying down the principle that 50 per cent of the issue should be placed through the bankers. Another property with $9,000,000 of gross revenue goes somewhat farther. Local security houses were invited to help in the distribution with a definite commission per share. It was further understood that if at any time in the future the company's organization should sell over the counter to a customer originally handled by the investment house the regular commission would again go to the investment house, although the later sale had been made by the public utility organization.

In a third case, however, I find a certain customer-ownership manager blaming the investment bankers for all his troubles as regards keeping the customer-ownership shares from coming back again on the market.

Profit-Sharing Stocks in Demand

In the financial world at present we find an enthusiasm for common stocks, or stocks which participate in the expanding earnings of the utility, and in stocks such as certain of the investment trusts which are specifically designed to depend upon appreciation in value rather than by stable earning value.

This enthusiasm should encourage the trading-out habit in customer-ownership preferred, in order to take profits and in order to take up securities where there is a "kick." Your customer-ownership movement has performed a very valuable service in adding a large number of security investors to the present market. However, will those new investors be content to avoid diversification and concentrate in your securities, or, if they diversify, will there be new difficulties in holding them as customer stockholders for your issues? Will they keep your shares and sell others?

As the positions of your issues improve in the investment market, are you, for many years or for all time, to continue paying 7 per cent dividends on old issues where 5½s and even 5s are possible? In other words, are you in a position to take advantage of better financial conditions through refunding?

Rural Holdings Less Fluid

It would appear probable that in most cases rural investors in customer-ownership preferred would be easier to hold than city investors, by which I mean that securities will be put away for permanent holding to a greater extent.

Where common shares have a $25 par value, can you take care of the demand for a share in additional profits through promoting common stock sales in contrast to preferred stock?

Are your local public relations so good that you can dispense to a moderate degree with preferred-stock holders in order to finance at lower cost? Does the expression "customer ownership" continue to serve its special purpose under the present enthusiasm for profit-sharing stocks?

One opinion heard in the East insists that one of your pressing problems will be to hold the present number of customer owners. A customer-ownership committee on the Pacific Coast states bluntly that the dominating question in the present stage of development of this customer-ownership movement is whether you can hold the present number of customer stockholders. Executives whom I have directly conversed with refuse to acknowledge the correctness of this point of view. Each of you, as I see it, must form a judgment as to your own local situation.

Maintaining a Market

There are many occasions when an investor desires, quite properly, to liquidate his holdings. This means that proper facilities should be in existence to provide a resale market. Is the customer-ownership organization of the public utilities equipped to meet all the legitimate forces that tend to produce a supply of securities for resale? I leave with you the question as to how far it may be possible to develop a program of co-operation between the utilities and the investment bankers, or, do you prefer to list your issues on some stock exchange, when there is little or no responsibility on any single group for maintaining a stable market. I must point out that at present there are undoubtedly a majority of instances where the resale problem is not serious, but I think it is obvious that the changing conditions tend to the greater prominence of this problem.

Let us consider for a moment this "trading-out" problem. In all merchandising of securities a very desirable characteristic is that a security has a prospect of increasing in price. When the increase has come to pass and the security is up nearer the call price, another security with good hopes for higher prices has an advantage as regards attractiveness to customers.

One of the large holding companies found that about 30 per cent of its common stock transfers were for the purpose of taking profits.

From another point of view, an unseasoned security sold originally at a low price in the course of years takes on higher values and becomes interesting to an entirely different type of investor, for example, the institutional buyer. Consequently, it seems reasonable to state that "trading out" is a natural and important situation in all merchandising of securities, and definite preparations should be made to deal with it. In recent months there has been much activity in common stock and many investors have become very actively interested in such securities. This is another force tending in certain localities to encourage "trading out," and it has a bearing on the present customer-ownership situation. I wish to leave in your minds this question, to what extent, in dealing with this "trading-out" problem, is it possible for co-operation to be built up between the customer-ownership department of public utility companies and the investment bankers of the country?

I cannot in any way make specific suggestions. In one

locality conditions may be several years ahead of another. Fundamentally different methods may be necessary.

Perhaps one might summarize the situation with the opinion that the public utility industry, in so far as it adjusts itself to changing general conditions and in so far as an individual company successfully adjusts itself to its own local conditions, is destined to occupy a most outstanding position as a constructive force in the industrial development of this country.

High Intensity and No Glare

AN ILLUMINATION design calculated to enhance the appeal of the merchandise displayed is apparent in this new showroom of the Sioux City Gas & Electric Company. The ceiling outlets are spaced on 12-ft. centers. Each outlet is wired for 1,000-watt capacity and equipped with a 20-in. "Kay Line" radiant inclosing type glass unit. The light center has been corrected for use of 500-watt "Mazda" C clear lamps, and with a capacity of 1,000 watts per outlet the present intensity can be doubled. Another advantage of using the 20-in. inclosing glass unit with a 500-watt lamp is that the effect of building up surface brightness is obviated. An intensity of 30 ft.-candles is averaged throughout the entire room.

Localized Hardening with Electric Heat

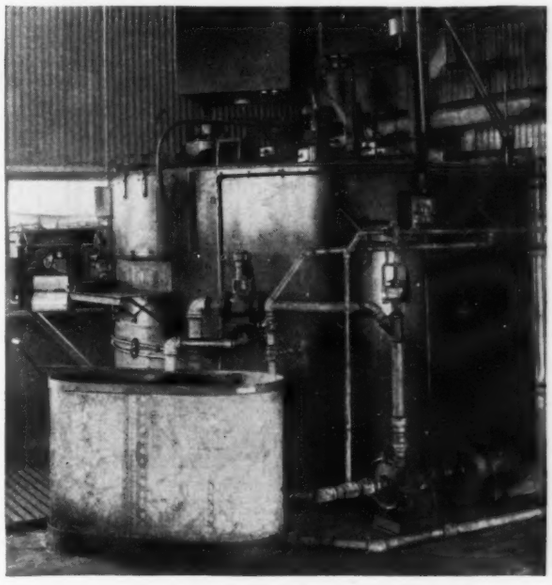
APPLICATION of electric heat enabled the Studebaker Corporation to localize hardening of small automobile parts, according to G. Coley, sales metallurgist of the Detroit Edison Company. The parts are small round shafts, about ½ in. in diameter by about 11 in. long, and are made of low carbon nickel-molybdenum steel, pack hardened to give a high carbon case. The problem was to produce these shafts with a very high surface hardness in the middle and keep them soft enough to machine at both ends.

After various other methods were tried the solution was finally found in the adaptation of a welding machine to this work. The welding points on the machine were replaced by pairs of copper grips grooved to receive the ends of the shaft in such a manner that when the grips are closed on the shaft by bringing down the operating handle of the machine the current flows through the shaft and heats it only in that section between the grips. The ends, not being heated, are therefore not hardened when the pieces are quenched. After the grip pressure is applied the ammeter on the machine registers about 140 amp. As the shaft heats the resistance increases and the ammeter needle gradually drops back. When the steel enters its critical temperature range the ammeter needle stops momentarily at about 14 amp. This momentary stoppage of the ammeter needle indicates that the resistance, and consequently the temperature, of the steel is temporarily constant. This is caused by the absorption of heat which occurs when metals and carbon are alloyed with iron.

If the steel is removed and quenched at the end of this short period it will be at its maximum hardness. This period is of such short duration that it might be overlooked by an inexperienced operator. Therefore, a time clock and lamp indicator are included in the machine design. The clock is set for the time interval necessary for the metal to reach the critical temperature and it then flashes a light. The operator removes the shaft and immerses it in an oil tank. The time interval is about ten seconds.

The machine is operating very satisfactorily with unskilled labor and is giving consistently accurate results. The shafts are hardened to about 85 scleroscope test in the middle and about 40 at the ends.

$1 per 1,000 Lb. for Treating Steel



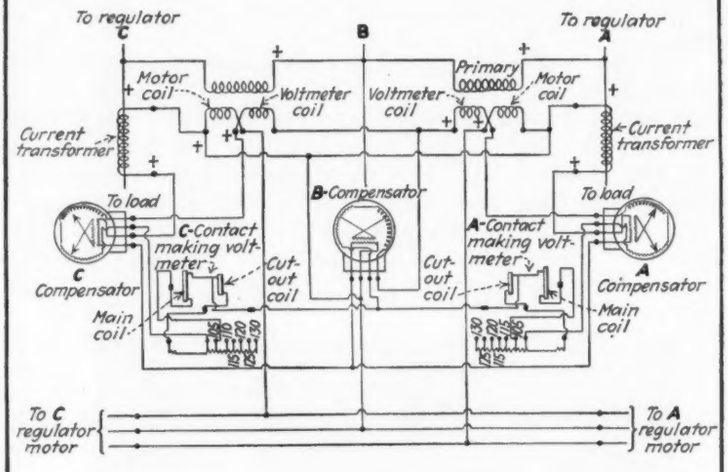
THE single-tank quenching system is used with a 116-in. rotary hearth electric furnace in the San Leandro, Calif., plant of the Caterpillar Tractor Company. The furnace has a connected load of 120 kw. and is used for heat treating and hardening various tractor parts over a temperature range of 1,400 to 1,600 deg. F. Operating at 1,420 deg. heating solid round bars 1⅞ in. in diameter by 12¼ in. long and weighing 9¾ lb. each, the output of the furnace is 58 bars per hour, or a weight of 565 lb. Energy consumption is 56.3 kw.-hr., or 10 lb. of steel per kilowatt-hour. At 1 cent per kilowatt-hour this is equivalent to $1 per 1,000 lb. of steel treated. The single-tank quenching system has displaced an older method using three tanks with an overhead gravity pressure tank. Two other electric furnaces are in operation in the same plant.

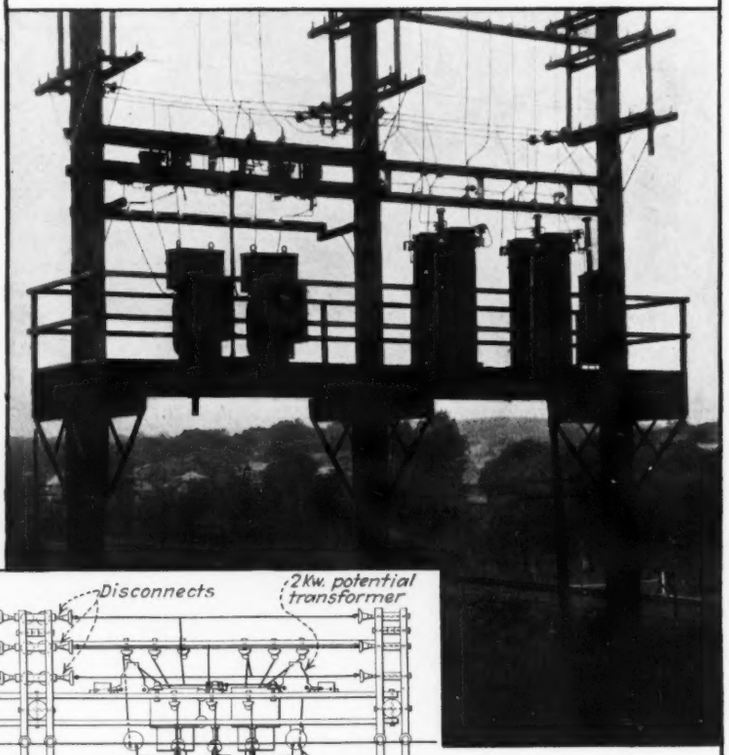
Regulated Service for Growing Sections

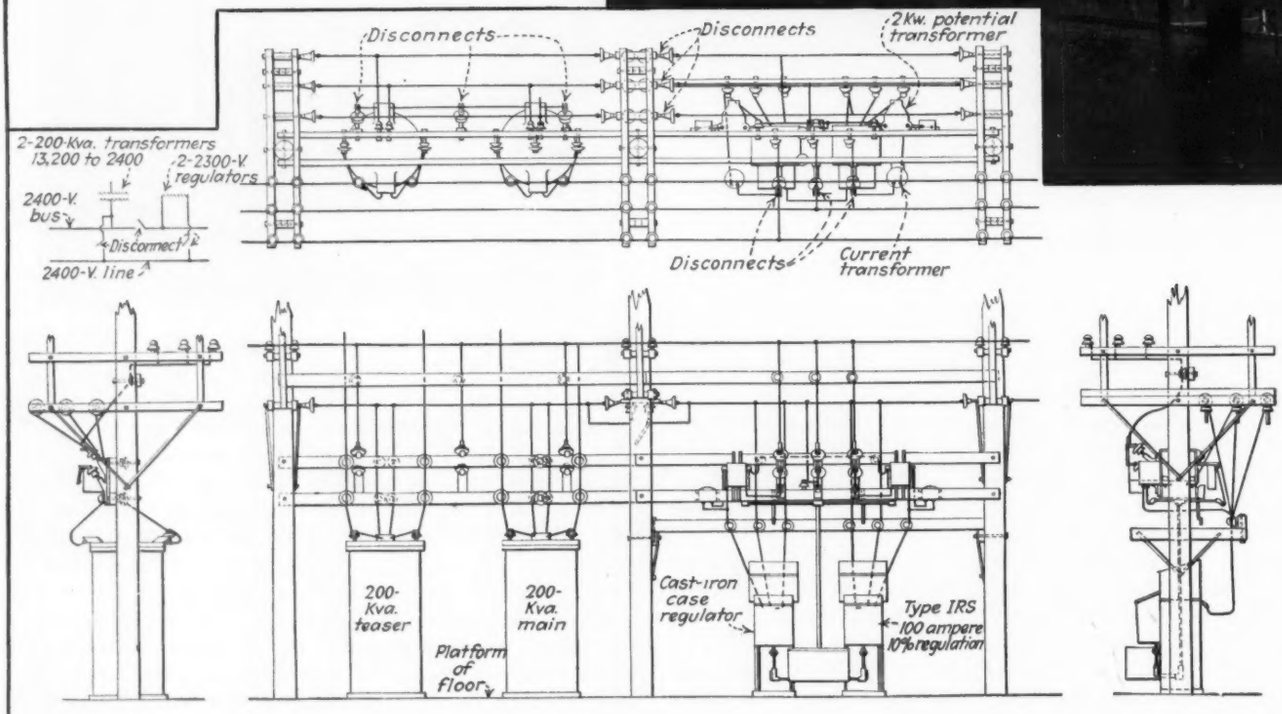
FREQUENTLY residential or industrial sections will spring up around cities at places remote from existing 2,400-volt substations. The initial load may not justify the building of a distribution center such as the ultimate development will warrant. Meanwhile, regulated light and power service must be rendered.

The accompanying illustrations show the type of construction which one Eastern company has used in about thirty cases to postpone a heavy investment.

Power is transmitted to these installations at 13,200 volts and there stepped down to 2,400 volts (regulated) for local distribution. The transformers are T-connected and the regulators provide 10 per cent buck and boost. If regulated service is not required the third pole and that portion of the platform for the regulators may be omitted.







Letters from Our Readers

"A Business Reason for Well-Paid Labor"

To the Editor of the ELECTRICAL WORLD:

This is written to congratulate you for the very sensible and full-of-good-sound-meaning editorial "A Business Reason for Well-Paid Labor," which appeared in the ELECTRICAL WORLD dated April 13.

There is already a large section of our American business world that is in agreement with the position you have taken in this editorial, and if the attitude toward labor which you recommend finally becomes practically universal, then we will never be bothered in this country with socialism, communism or any other disagreeable-ism.

Hugh L. Cooper & Company, Inc., New York City. HUGH L. COOPER.

Industrial Substation Requirements

To the Editor of the ELECTRICAL WORLD:

Where an industrial plant purchases a sufficient amount of power to make it necessary to install some form of substation virtually all the central-station companies have regulations as to what type of equipment should be used and how it should be installed.

Unfortunately, in too many cases the requirements are based on central-station practice, which is unsuited to the small industrial plant. This places an undue investment burden on the industry which is unwarranted even on the basis of sound engineering. Design of such equipment is not economically accomplished by using the very highest grade of material obtainable regardless of the duty cycle, yet that seems to be the method adopted by several power companies. Nor, on the other hand, can it be economically accomplished by resorting to equipment which falls short of a safe service standard.

To cite a specific instance, the case can be mentioned where a loop feeder system is installed, yet the power company requires that the customer purchase and install, in series with the power company's circuit breaker, a breaker having the same rupturing capacity as that of the power company. In one instance where this requirement was made we were able to get the power company to rescind this rule, but in every other case the power company refused to modify these requirements.

Central-station companies, as a whole, are mindful of their obligations to industry and the public and in the past have shown many evidences of it. The matter of customer substation design offers an immediate opportunity for power companies to meet, in an economic way, those responsibilities which have inherently fallen to their lot. While some companies will stoutly defend their rigid requirements as necessary to assure continuity of service to all their customers, is that really the case? In instances where the requirements are reasonable and along the lines of economic engineering, do the records show that continuity of service has been interfered with in any way? Let the facts decide instead of leaving the decision to the fancy and ideas of individual central-station engineers.

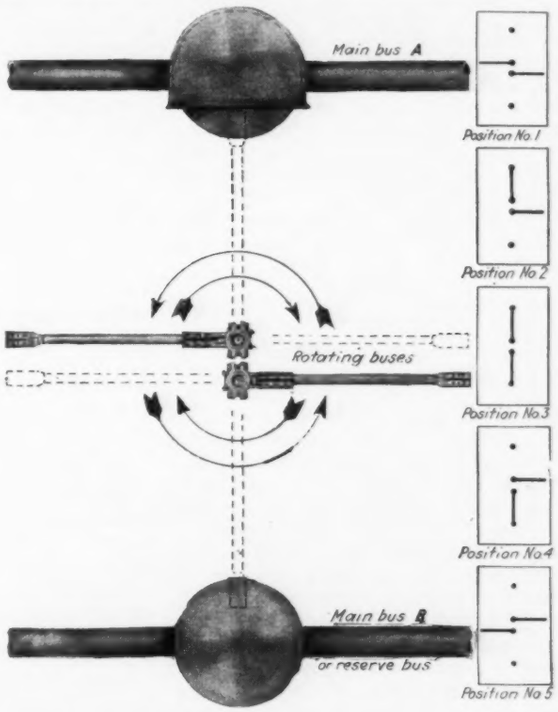
The question of economic design of customer substations is a matter which needs revision so far as many companies are concerned, and it is the duty of the power company to study this situation carefully and meet it along the lines of good economics and sound engineering.

The R. B. Engineering Corporation, New York City. EUSTACE C. SOARES.

Rotating Bus Arrangement for Outdoor Substations

To the Editor of the ELECTRICAL WORLD:

The article which appeared in the ELECTRICAL WORLD of Dec. 15, 1928, describing the rotating bus arrangement for outdoor substations did not include sufficient detail to make the operation of the scheme perfectly clear. The accompanying sketch and the words of explanation with it will do so, I hope, and I shall appreciate your giving them space in the ELECTRICAL WORLD.



One Phase in a Rotating Bus Arrangement

The parallel rotating buses, which lie normal to the main buses and are shown in section in the drawing, move the disconnecting switch blades clamped to them through an arc of 180 deg. in one complete operating cycle. The next cycle carries the blades back to their original positions. The buses do not rotate simultaneously, but alternately, so that the blade movement sequences are as shown in the diagram. A change in connection from main bus "A" to main bus "B" must include the temporary paralleling of these main buses when unit control is used. The scheme may be applied with separate controls of each rotating bus, in which case there is no relation between their movements and the device becomes simply a pair of disconnecting switches with their blades electrically connected together.

Delta-Star Electric Company, Chicago, Ill. ALFRED ALSAKER, Chief Engineer.

The Value of Customer Ownership

BY ROGER BABSON*

"I KNOW of no investment, paying over 6 per cent, which is as safe as first preferred customer-ownership stocks of public utility companies. . . . Customer ownership of this kind is one of the greatest contributions to economic welfare and progress which has been developed in recent times."

**From article "The Economic Significance of Customer Ownership" in "Public Utilities Fortnightly."*

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

The Limentre Hydro-Electric Installation, Italy.—A further interesting example of hydro-electric development in Italy is presented by the Limentre installation, from which power will be supplied for the railway between Florence and Bologna, a distance of 120 km. There are two Escher-Wyss turbines, each operating a 5,000-kva. Ansaldo alternator. The height of water is 43 m. to the turbines.—*Engineering (England)*, March 29, 1929.

Hydro-Electric Station Coindré (France).—A. CURCHOD.—In four installments, covering 73 pages with 72 illustrations, the author gives an exceedingly detailed description of the hydraulic and electric equipment of this sixth and newest water power supply station for the electrified section of the Paris-Orleans Railway. By the erection of two large dams across the two branches of the river Rhue sufficient storage capacity was obtained to operate the Coindré station at an average of 33,000 hp., utilizing a net drop of 400 ft. Three vertical-shaft Francis turbines were installed, each directly connected to a 9,550-kva., 428-r.pm., three-phase generator, delivering 5,500 volts at 50 cycles. While each generator carries its own exciter, a 300-hp. double Pelton-wheel-driven direct-current generator set provides emergency excitation and covers also the local power demand of the plant. Adjacent to the power house is an outdoor transformer and switching yard, in which three banks of radiator type transformers of 9,300 kva. per bank step up to 90,000 volts transmission line potential. Waterwheels and generators are of French manufacture, transformers and high-voltage circuit breakers were furnished by a Swiss concern, while the lightning arresters are of American origin.—*Revue Générale de l'Electricité*, February 16 and 23, March 2 and 9, 1929.

Transmission, Substations and Distribution

Transmission by 16,200-Volt, Single-Conductor Cable, 60,000 Kva., 3 Miles.—C. E. SCHWENGER.—With the transmission to the city of Toronto of electric power from the east, the problem of installing a large block of it by the Toronto Hydro System presented itself. The Leaside terminal station for receiving 220 kv. power at Toronto is located at the northeastern outskirts of the city and is about 3 miles south of Carlaw substation in the city. The latter station is the most easily accessible point with respect to the Leaside terminal, where a large block of power could be used, and also in the Toronto distribution system. It was finally decided to install single-conductor cables in 2½-in. conduit. The equilateral spacing of the cables for each circuit is uniform.—*Electrical News (Canada)*, March 15, 1929.

Fused Arcing Horns and Grading Rings.—PHILIP STEWART.—A consideration of the use of fuses on insulator strings of high-voltage overhead conductors to interrupt the arc at times of flashover before the line relays operate to disconnect the circuit. Consideration is first given to the original development of this idea in which a fuse was connected between a line conductor and an arcing ring attached to the second insulator unit. When an excessive voltage occurs on a conductor to ground there is a flash between the two pronged horns on the top insulating unit and the ring. This circuit is completed through the fuse, which immediately opens, breaking the arc. Further consideration is given to a later development of the principle in which two expulsion type cables replace the two pronged horns at the top of the insulating string and the arcing ring is placed at the conductor end of the string. Data are presented from tests and from experience on about 100 miles of 66,000-volt circuit of the Union Gas & Electric Company, Cincinnati, Ohio.—*Report American Institute of Electrical Engineers*, March, 1929.

Equilibrium of Forces Acting on Suspension Insulators.—SEIICHIRON NODA.—The problems on the equilibrium of forces acting on a suspension insulator which supports the wire spans on both sides of it are dealt with: First, the case of two consecutive wire spans lying in the same vertical plane is considered. The material will also serve as an introduction to further exploitation in which the effect of the change in the mechanical conditions of continuous straight wire spans supported by suspension insulators will be considered; second, the case of two consecutive wire spans not lying in the same vertical plane is dealt with. The discussion deals with the side deflection of the suspension insulator which determines the clearance between the wire and the arm of the tower which supports the insulator, in the case where there is a change in the direction of the continuous wire spans, both when two consecutive wire spans are those of suspensions from points at equal elevations and when there is a change in the heights of the points of suspension. In the latter case, when there are also wind loads, even when the two consecutive wire spans lie in a vertical plane, there will occur a side deflection of the insulator which supports the wires.—*Memoirs of the Ryojun College of Engineering (Japan)*, December, 1928.

Generation, Control, Switching and Protection

Automatic Rectifier Installations.—I. MICHELUZZI.—In an effort to minimize maintenance and attendance, the Viennese rapid transit system started some years ago to introduce in its many substations fully automatic mercury-arc rectifiers in preference to rotating converters. Today practically all of these stations are so equipped, having a total installed rectifier capacity of 53,000 kw. Lately six 2,000-amp. and ten 4,000-amp. rectifiers were added with complete automatic equipment. By means of only four small pilot wires, several such stations are connected to an attended one, so that remote control and supervision of them is possible in addition to their self-maintained operation. A new type of master relay keeps each station on the line and governs its regulation, starting, stopping, switching and reclosing. The master relay is driven by a synchronously vibrating armature, which turns by continuous ratchet action a small master controller.—*Elektrotechnik und Maschinenbau*, February 17, 1929.

Pilot-Wire Street Lamp Control.—A. C. JOHNSON.—Little thought has been given by the electric power engineer to the control of street lamps and many still resort to hand control. Many others have installed time switches pending the advent of something better. The millennium of the lighting engineer will be reached when he can obtain perfect wireless control. Another method of control is the pilot-wire system, and it is possible that the ultimate solution lies in that direction. Pilot-wire control enables the switching of lamps from one or more control stations at a moment's notice, a feature which is invaluable, especially in case of dark evenings. It is generally agreed that once installed the pilot wire insures maximum service at minimum operating cost, but it is too often condemned in advance without weighing the pros and cons because of the pilot wire itself.—*Electrical Review (England)*, March 29, 1929.

Units, Measurements and Instruments

High-Voltage Laboratory.—E. MARX and F. UNGER.—The University of Braunschweig added a large block of buildings to its property to house a modern electrical institute. Of particular interest is the first part, in which the high-voltage laboratory is described in detail. There are three 200-kva., single-phase, 500-kv. transformers provided for, one of them insulated for 1,000,000 volts. An impulse set, also

for 1,000 kv., is installed, which is supplied from a 100-kv. transformer. Two Tesla sets in series connection provide a high-frequency potential of 2,000,000 volts. For tests with direct current, a permanent 500-kv. direct-current valve tube set is installed, which may be augmented by two more tube stages to 1.4 million volts d.c. Ten single-phase testing transformers of 30 to 150 kv. and a Dufour cathode-ray oscillograph are other outstanding parts of the equipment. The second part of the paper describes the apparatus installed in the machine and measuring laboratories. — *Elektrotechnische Zeitschrift*, February 14 and 21, 1929.

Some Technical Considerations Concerning Power Factor in Relation to Tariffs.—E. W. HILL.—Attention is drawn to the desirability of clear definition of such terms as power factor, kilovolt-amperes, etc., with regard to tariffs. Ambiguities are possible and first sections of the article deal with those relating to polyphase power factors. The vector sum and arithmetic sum definitions of three-phase power factor are stated and a hypothetical three-phase case is considered in order to support the contention that the latter definition is more advantageous as a tariff basis than the former. A suggestion is made with regard to the basis of a tariff when there is diversity of incidence of demand on individual phases. The remainder of the sections deal with the use of sine and cosine meters and the possible ambiguities resulting from variable power factors. Two single-phase meters on three-phase balanced loads give rise to the same ambiguities from the same cause. A table of figures and a set of curves are given exhibiting the range of errors which may result in estimating kilovolt-ampere hours and average power factor from these combinations of meters. The conclusion is drawn that it is not advisable to use them in certain circumstances.—*Report of the Institution of Electrical Engineers (England)*, April 5, 1929.

Illumination

A Cinema Installation.—A recently opened theater in England is claimed to be one of the largest cinemas in Europe and its many movel electrical features make it also one of the most interesting. The art of color and effect lighting may still only be in its infancy, but that distinct and creative advances are rapidly being made will certainly be immediately apparent on a vist to this cinema. To describe the installation generally it may be said that a high-voltage supply is brought into a transformer vault, where it is transformed to 230 volts, single phase by means of two 250-kva. transformers. The secondary leads are taken through a dividing wall to busbars of a low-voltage open type switchboard consisting of eight panels. A double panel 1,250-amp. circuit breaker controls the entire board, except the cooking panel, the whole of the load being governed by a maximum demand rate. The main white lighting scheme consists of daylight lamps mounted in the ceiling and globe fittings and is controlled from two positions. Many lighting innovations are introduced in this installation. — *Electrical Review (England)*, March 29, 1929.

Motors and Control

Electrical Equipment for Factory Cranes.—G. HOOTZ.—Various types of cranes are employed in factory yards for dealing with loose and piece goods. Traveling and slewing cranes generally suffice for small yards, whereas preference is given to the loading bridge when the storage yard is very extensive. The crane is equipped with a grab or a hook, according as loose goods, such as coal, gravel, etc., or piece goods, such as cases, parts of machinery, etc., have to be handled. The electrical equipment of such cranes includes the control of motors, brake-lifting magnets, controller resistors, drum type limit switches, panels, measuring instruments, etc.—*A.E.G. Progress (Germany)*, March, 1929.

Agricultural Electric Machinery. I.—R. BORLASE MATTHEWS.—The annual Paris agricultural exposition shows, among other things, many electrical appliances for use on farms such as threshing machines, ploughs and implements and barn machinery and equipment for the smaller agricultural industries, such as poultry keeping, and so on. —*Electrical Review (England)*, March 15, 1929.

Heat Applications and Material Handling

Advantages of Electric Heat in a Newspaper Plant.—E. E. SCOFIELD.—Following more than a year's experience with electrically heated stereotype pots, the Cowles Publishing Company of Spokane expresses complete satisfaction with the operation of the equipment and is highly enthusiastic over the advantages of the electrical installation as compared with fuel-fired melting pots. The electrically heated equipment was installed early in 1928, when the publishing company moved into a new building where it publishes a morning and evening paper with a combined circulation of approximately 100,000 daily.—*Electrical West*, April 1, 1929.

The Future of Water Heating.—M. O. F. ENGLAND.—The future development of water heating for domestic purposes depends very largely on its load factor, and in this connection electric heating engineers are undoubtedly in a position to be of definite help. The consumer gains not so much from the relative cost of electricity and other fuels, but from the all-round advantages, financial and otherwise, of the electrical installation over some other system. Modern electric boiler plants can run without attention, giving a labor saving. The efficiency of a water circulating electric boiler plant installation is high (between 85 and 90 per cent) if the surfaces are properly insulated. For buildings of medium size, where the kilowatt capacity does not exceed 300, a few super-elements should be used in preference to a multitude of small ones. For large buildings electrode type boilers should be installed on account of simplicity and ease of regulation. Automatic devices for leveling out loads in networks are to be recommended, especially those which will function at fog times.—*Electricity (England)*, March 21, 1929.

Miscellaneous

Electric Clocks.—A. RABINOWITSCH.—Agreement with Greenwich time, which is adopted as the prime basis of standard time throughout the world, is an essential factor of present-day requirements. Moreover, the exact agreement of all clocks in a district, town or in large business premises is of the utmost importance. Thus the clocks in railway stations, public buildings, etc., must always show the correct time if economy and efficient organization are to prevail. Coincidence of the time registered by all the clocks in these places can only be warranted by an electric system. A description of master and secondary clocks, including synchronized secondary clocks, individual clocks with independent movement, turret clocks, recording clocks and synchronous clocks.—*A.E.G. Progress (Germany)*, March, 1929.

Portable Petrol-Driven Self-Priming Drainage Pump.—Perhaps one of the most compact types of petrol-driven engines is to be found in that increasingly popular form of boating in which what is known as an outboard motor is used. These engines are necessarily light in weight and completely self-contained and it is not surprising therefore that the quality of portability and ease in erection are now being utilized in other directions than that of propulsion of light craft. These motors, which turn up 2,100 r.p.m., developing 2 hp. and weighing but 24½ lb., are arranged to drive an impeller situated at the bottom of a tube and drawing water out of such places as manholes, etc.—*Engineering (England)*, March 22, 1929.

Power Transmission Cable Subsidized.—The Italian government has recently decided to grant subsidies toward the cost of electric power transmission lines at voltages above 2,000, the construction of which has been commenced in Italy since January 1, 1928. The subsidy is divided into three groups, 0.10 lira (1.93 cents) per kilogram of copper employed in the case of conductors weighing more than 1,000 kg. (2,300 lb.) per kilometer; 0.15 lira (2.89 cents) per kilogram for those weighing between 500 and 1,000 kg. (1,150 lb. and 2,300 lb. re-

spectively) per kilometer; and 0.20 lira (3.86 cents) per kilogram for those weighing not more than 500 kg. (1,150 lb.) per kilometer. In connection with the scheme the government has granted an annual subsidy of 54,752 lira ($10,577 approximately) for a period of fourteen years to the Societa Forz Idroelettriche Alto Caffaro in connection with a new generating station on the Caffaro River near Savona, and a subsidy of 3,595 lira ($986 approximately) for fifteen years to the Societa Adriatica di Elettricita in respect of a transmission line between Cotignola and Ravenna.—*L'Elettricita (Italy)*.

Book Reviews

Principles of Scientific Purchasing

By Norman S. Harriman. New York: McGraw-Hill Book Company, Inc. 301 pages. Price, $3.

Practical and theoretical aspects of the problem of purchasing are blended in a manner which enables the reader in a rather unique way to grasp the significance of modern purchasing policies. The book starts with very early beginnings in the marketing field and develops the importance of the purchasing function both from an academic and from a practical point of view from these early beginnings to present more complicated practices. Financial, psychological and legal aspects of the question are dealt with individually and a very illuminating appendix covers the actual purchasing organization and procedure of companies such as the Western Electric Company, New York Central Railroad and others.

Moderne Lichttechnik in Wissenschaft und Praxis

By Professor Dr. J. Teichmüller. Berlin: Union Deutsche Gesellschaft. 123 pages, 90 illustrations.

The author, director of the Institute for Illumination at the Technical College at Karlsruhe, was selected to take charge of the lighting demonstration at the Düsseldorf Exposition for Hygiene and Social Betterment in 1926. Accordingly he set about the task of devising suitable demonstration rooms, covering the principles of illumination and illustrating applications in its various phases, residential, stage lighting, art illumination, and others. The book is essentially an illustrated guide through that exhibit. The man who is confronted with the problem of getting up a similar exhibit ought to find numerous suggestions in it.

Electrification of Czechoslovakia 1918-1928

By J. Tománek, editor. Prague: Elektrotechnicky Svaz Ceskoslovensky (C.-S. Elektrotechnical Union). 177 pages, 36 illustrations, two insert maps.

Abundant statistical information showing the progress in electrical development of Czechoslovakia during the past ten years is contained in this volume, which in addition to being printed in the language of the country contains a complete German version, together with digests in English and French. National statistics are worked out and compared with corresponding figures for other countries, showing Czechoslovakia's rank among the nations of the world; essential facts are given (including financial data) regarding individual companies, requirements of the law of 1919 and maps, the whole constituting an effective presentation of the country's progress during the decade. The book appears as a jubilee publication at the tenth anniversary of the Czechoslovakian Republic.

Le Régulateur Automatique pour Machines Electriques

By Ernest Jouillard. Lausanne: Librairie Payot & Cie. 173 pages, 66 illustrations.

The author has applied mathematical analysis to the transient phenomena that take place when an automatic regulator functions. After developing a general method applicable to any kind of regulator, he considers more particularly the automatic voltage regulation of an electrical machine. The mathematical results reveal the relative importance of the characteristics of the several parts that constitute the unit consisting of the machine and its regulator, such as the time constant of the machine, the rapidity with which the regulator operates and the speed of the correction itself. The computed results are verified by a full series of tests. The conclusions deducible from the formulas are of significance as a matter both of design and of operation. The material presented will be of interest to those concerned in any way with the technical aspects of automatic regulation.

Der Quecksilberdampf Gleichrichter

By K. E. Müller-Lübeck. Second volume. Berlin: Julius Springer. 350 pages, 340 illustrations and four large tables.

In the first volume, issued by the author last year, the physical and mathematical fundamentals of mercury-arc rectifiers were presented, paving the way for the second volume, in which the calculation, design and application of rectifiers are given for the first time in a complete and comprehensive manner. Starting with the theory of rectifier transformers, data are presented for the direct-current wave character and the influence of power factor. A short historic chapter, beginning with Cooper-Hewitt's 1903 model, leads logically to the gradual development of the glass and steel type of modern days. The chapter on mechanical design leaves no detail unmentioned and is particularly well illustrated. Although the author is connected with a large German concern, a great deal of information is given on other types than those of the author's firm. The chapter on auxiliaries covers pumps, gages, protective apparatus and high-speed circuit breakers. The book closes with a full description of the rectifier equipment of the Berlin rapid transit system, which is probably the largest installation of its type, comprising 31 small and eleven large rectifier stations, totaling about 60,000 kw. output.

Book Notes

INTERMEDIATE ELECTRICITY AND MAGNETISM. By R. A. Houston. New York: Longmans, Green & Company. 163 pages, illustrated.

This is an elementary and well illustrated textbook dealing with magnetism and the elements of the electric circuit. Professor Houston is connected as lecturer and examiner with several universities in Scotland and has written this text as a result of his teaching experience. Problems are included and illustrations help clarify the treatment. The book is elementary for a college course.

HANDBOOK OF REFRIGERATING ENGINEERING. By W. R. Woolrich. New York: D. Van Nostrand Company. 331 pages, illustrated. Price, $4.

This is a comprehensive handbook developed by Professor Woolrich to cover the theory and practice of modern refrigerating engineering. It is a series of lectures with problems and questions as addenda to each lecture so that the book can be used as a text in colleges. All modern forms of refrigeration are discussed and many tables, charts and other data afford readers definite information on refrigeration.

THE PROFESSION OF ENGINEERING. Essays edited by D. C. Jackson and W. P. Jones. New York: John Wiley and Sons. 124 pages. Price, $1.50.

Experts and experienced engineers in the main branches of engineering have written of their respective professions and Professors Jackson and Jones have edited these essays to give a unity in their assembly. The group of essays and their authors are as follows: The Engineer and His Education, by D. W. Mead; Success in the Engineering Profession, by D. W. Mead; Civil Engineering, by G. F. Swain; Mechanical Engineering, by G. H. Barrus; Mining Engineering, by Robert Peel; Electrical Engineering, by H. W. Buck; The Electrical Engineer, by J. H. Hammond; the Chemical Engineer, by J. H. Hammond, and the Engineer's Contribution to Modern Life, by Herbert C. Hoover. The authors and the titles indicate the quality and scope of this book and it is a welcome contribution to engineering literature.

Books Received

"Radio Operating." By Arthur R. Nilson and J. L. Hornung. New York: McGraw-Hill Book Company, 267 pages. Price, $2.

"Six-Place Tables." By Edward S. Allen. New York: McGraw-Hill Book Company, Inc. 167 pages. Price, $1.50.

News of the Industry

Sale of Journals to Power Interests Assailed

International Paper Company's Purchase of Boston Periodicals Regarded with Suspicion, and Trade Commission Summons Massachusetts Men

MUCH criticism has been aroused in some quarters by the recent sale of a large interest in the Boston *Herald* and Boston *Traveler* to the International Paper Company. Archibald R. Graustein, president of the paper company, is expected to appear before the legislative committee on rules at Boston next Monday to answer questions about the transaction and to set forth the policies of this organization in regard to power system control and development in New England. Subpœnas have been issued by the Federal Trade Commission calling for the appearance at Washington on Tuesday of representatives of the paper company and others, presumably in connection with the *Herald-Traveler* purchase. Those summoned to testify are Robert Lincoln O'Brien, former president Boston Publishing Company; W. N. Hurlbert, vice-president International Paper & Power Company; James Garfield, secretary Boston Publishing Company, and John R. Macomber, a director of the International Paper & Power. John R. Macomber of Harris, Forbes & Company, Boston, is also expected to testify in this connection before the federal board.

The creation of a committee by the American Society of Newspaper Editors to study allegations that the International Paper Company is attempting to control newspapers was proposed at the society's convention last week at Washington by Willis J. Abbot, editor of the *Christian Science Monitor*. Mr. Abbot said that the paper company, by recent efforts to buy control of the stock in several large newspapers, "justified the suspicion that it was endeavoring to control the editorial columns for support of its power projects."

The editor's attack followed a news article in the Boston *Post* which said: "Approximately 50 per cent of the stock of the Boston Publishing Company, owner of the Boston *Herald* and the Boston *Traveler*, has been sold to the International Paper Company of New York, a subsidiary of the International Paper & Power Company, which owns the New England Power Company and other vast power interests in the United States and Canada. Control of the *Herald* and *Traveler* thus passes to the paper and power interests, which will be represented here in Boston by three trustees."

The Boston *Post* editorially called the transaction "a blow to the principle of a free and untrammeled press" and "a gravely improper action on the part of a great corporation which is the dominant interest in the electric power industry of New England." Senator Walsh of Montana received the assent of the United States Senate to the reprinting of the *Post's* articles in the *Congressional Record* as pertinent, in his opinion, to the current investigation of the light and power industry by the Federal Trade Commission.

The Hearst newspapers in Boston and elsewhere have had prominent articles on this newspaper investment of the paper company and see in it another attempt of the "power trust" to influence public opinion.

On Wednesday of this week, when the American Newspaper Publishers' Association opened its annual convention in New York City, Colonel Robert Ewing of the New Orleans *States* offered a resolution seeking to have the association formally condemn the transaction. Criticism was also made of aid extended by the International Paper Company to S. E. Thomason in the purchase of the Chicago *Journal*.

The Boston *Herald* and the Boston *Traveler* declare that the investment made in them by the International Paper Company will not influence the policies of the paper, but is merely a business arrangement whereby a great paper-producing concern secures an outlet for some of its product. Mr. Thomason at the New York convention just referred to made a similar statement.

World Congress Committee Banquets Debuchi

To Ambassador Debuchi of Japan a dinner was given on Wednesday night at Washington by the American committee of the World Engineering Congress to be held at Tokyo in the fall beginning October 29. The committee comprises more than fifty distinguished engineers and scientists. Dr. Elmer A. Sperry, chairman of the committee, presided at the dinner, and John Hays Hammond and Gano Dunn of New York, past-president of the A.I.E.E., spoke.

"There is a cross sight in the Japanese intellectual attack," Mr. Dunn said, "which is fruitful of results and with which it will be beneficial for us and the rest of the world to have an opportunity of becoming better acquainted through the assemblage of engineering and scientific men in Tokyo."

The Toyko congress, Ambassador Debuchi said in his response, will bring co-operation between East and West.

Present John Fritz Medal to Mr. Hoover

Kimball, Pupin, Freeman and Reynders Represent the Four Major Engineering Societies at White House Ceremony—President Gives Luncheon

THE John Fritz gold medal for 1929 was presented to President Herbert Hoover at the Executive Mansion, Washington, on April 25, at a luncheon given by Mr. Hoover to present and past members of the board of award, preceding medalists and presidents and secretaries of the American Societies of Civil, Mining and Metallurgical, Mechanical and Electrical Engineers.

This medal is the highest honor bestowed by these four national engineering societies, having a membership of sixty thousand. It is awarded not oftener than annually for "notable scientific or industrial achievement, without restriction on account of nationality or sex." In accordance with custom, the award to Mr. Hoover was made tentatively and without announcement in October, 1927, and was formally confirmed and announced one year later.

At the presentation on Thursday, Dexter S. Kimball, dean of the College of Engineering, Cornell University, and chairman of the present board of award, presided and gave a brief history of the medal. He is a past-president of the American Society of Mechanical Engineers. Dr. M. I. Pupin, a past-president of the American Institute of Electrical Engineers and a member of the board of award, spoke briefly of the human elements of Mr. Hoover's life-work. Dr. John R. Freeman, past-president of both the American Society of Civil Engineers and the American Society of Mechanical Engineers and a former member of the board of award, spoke of Mr. Hoover's work as an engineer.

J. V. W. Reynders, past-president of the American Institute of Mining and Metallurgical Engineers and chairman of the board which made the award to Mr. Hoover, presented the medal and quoted from the certificate which accompanied it the citation: "To Herbert Hoover, engineer, scholar, organizer of relief to war-stricken peoples, public servant." Mr. Hoover responded in appropriate terms.

Among the men to whom the medal has been awarded in preceding years are J. J. Carty, Elmer A. Sperry, Edward Dean Adams, John F. Stevens, Ambrose Swasey, Guglielmo Marconi (Italy), Eugene Schneider (France), Sir Robert A. Hadfield (England), Orville Wright, George W. Goethals, J. Waldo Smith, Elihu Thomson, Thomas A. Edison and Alexander Graham Bell.

In the States' Legislative Mills

Florida May Extend Jurisdiction of Its Railroad Commission to Light and Power Companies—Illinois and Wisconsin Legislatures Hard at Work

LEGISLATORS in Florida, as well as in Texas, may adopt a plan for state regulation of utility companies. In Illinois, Minnesota and Wisconsin utility bills of various kinds still await legislative disposal. A Massachusetts member wants the N.E.L.A. and the Harvard Business School investigated.

FLORIDA.—A bill has been introduced in the House which would place all electric power plants and transmission lines within or partly within the state under the jurisdiction of the Railroad Commission of the state and confer on these commissioners the duty of regulating and controlling them. Another House bill requires power companies to obtain easements from property owners before erecting high-voltage transmission lines outside corporate limits and empowers the Railroad Commission to regulate their construction.

ILLINOIS.—Among bills not before mentioned in these columns that have been before House and Senate committees for recommendation are one which changes the definition of public utilities so as to except persons and corporations selling electrical energy and other utility products to municipal utilities for resale, whether or not they be otherwise a public utility; one which increases power of cities so that they may sell electricity generated by others and distributed over any transmission line owned, leased or operated by the cities; one which requires a public utility making use of streets or alleys to obtain a franchise or license from the city in addition to a certificate of public convenience and necessity from the Commerce Commission, and one which allows a public utility, in fixing its charge, to classify its service as to amount, time used and purpose and permits it to grant reduced rates to its own employees.

Another bill provides for the incorporation and government of municipal utility districts with power to construct, own and operate public utilities and to issue bonds to pay for them. A House bill would allow orders by a city for the regulation of a utility to be appealed to the courts, as may the orders of the Illinois Commerce Commission, instead of being referred to that body; the percentage of voters necessary at referendum on home rule is reduced from 25 to 5 per cent. The Illinois Commerce Commission shall not authorize any public utility to acquire land by eminent domain until all persons having an interest in the land are notified, according to still another bill. The executive committee of the Senate is considering a resolution for a committee of seven members to investigate use of streets by utilties to construct high-tension lines.

Three reparation bills provide that if the commission finds, after a hearing, that a public utility has charged an excessive or unjustly discriminatory rate it may order the utility to make reparation, with the time for recovery of damages reduced from three years to one year, full amount of damage to be recovered, but actual pecuniary loss to be shown.

MASSACHUSETTS.—Investigation of the extent to which the distribution of electricity and gas in Massachusetts has come under control of outside interests was urged by several speakers this week before the joint committees on rules of the Legislature. Representative James E. Hagan of Somerville, who filed a resolution for such an investigation, said he had done so "because of certain developments which have been brought to the attention of the public and which constitute a challenge to the people of this commonwealth." He mentioned the purchase of stock of the Boston *Herald* and *Traveler* by the International Paper Company. He added: "I want to know, and I believe the people of this state will want to know, what is the relation between the Harvard Business School and the power interests. That is one of the things I had in mind in asking for an investigation of the activities in this commonwealth of the National Electric Light Association."

James B. Mahoney, general counsel for the New England Publishing Company, also attacked the Harvard school and Professor Ruggles, professor of public utility management. He characterized the activities of the utility holding companies as "frenzied finance."

MINNESOTA.—The Senate has passed a bill sponsored by E. L. MacLean of Minneapolis which would give the state Conservation Department authority to permit power development projects affecting state lands. The bill would give the department authority to change water levels on waters affecting state lands and adjust the damages from flowage and would also provide a method whereby the state might give its consent to power development and water-level changes on the international boundary. Consent of the state to projects of this kind on the boundary is deemed necessary, and at the present time there is no agency for the giving of this consent.

MISSOURI.—The House has voted, 38 to 26, to postpone indefinitely a bill to assess a tax not to exceed one-fourth of 1 per cent of the gross revenues of public utilities for the support of the Missouri Public Service Commission. The measure was designed to give the commission a fund that would enable it to perform properly the functions imposed upon it. At present the commission must depend upon uncertain biennial appropriations by the General Assembly, and it has had to postpone several valuation cases, to spread others over long periods, and in other cases to accept book audits for actual physical appraisals in deciding rate-base valuations. The public utilities of the state, however, did not favor the proposed method of supplying the commission with an income.

NEBRASKA.—The House finally passed the bill permitting cities of from 5,000 to 25,000 population operating municipal lighting plants to extend their lines and service a distance of 15 miles from their limits. Before construction of any such rural lines may be undertaken, the bill provides, the city shall enter into contracts with prospective rural patrons which will produce a total annual gross revenue to the city equal to not less than 15 per cent of the cost of such construction. The Senate had previously passed a bill making the distance 25 miles and permitting the pledging of three years' future earnings to construction, with the alternative of a bond issue. The House killed a Senate bill in the interest of oil-engine promoters, which took from councils in second-class cities and villages the right to renew franchises and made a 60 per cent vote necessary. It overrode the recommendations of its own committee and placed on its calendar a similar Senate bill applying to cities of the first class, a Senate bill requiring a 60 per cent vote to sell municipal plants, and a Senate bill widening the powers of councils to buy equipment, including generating machinery, without its having been included in the annual appropriation. These were the bills alluded to last week.

Governor Weaver has approved the bill appropriating $525,000 for a combination electric light and heating plant to serve the Capitol building and State University at Lincoln. No consideration was given by the Legislature to offers from the Iowa-Nebraska Light & Power Company, which serves Lincoln, to submit a proposal that it was believed would serve the state as cheaply without any capital investment.

The Senate committee detailed to investigate charges of undue influence exerted by power companies upon members of the faculty of the University of Nebraska reported that there was no improper contact in connection with the survey of rural electrification and experiments financed by the power companies and with which the university co-operated, and that in fact new rate structures beneficial to farmers have come through the co-operative plan of Prof. R. E. Brackett of the university as a direct result. The report was adopted.

PENNSYLVANIA.—The Pennsylvania Legislature adjourned last week. During the session a bill to appoint a commission to investigate the Public Service Commission was defeated, as was also a measure to take the appoint-

ment of the commissioners out of the Governor's hands and vest it in the Legislature.

TEXAS.—At a conference in Austin attended by Governor Moody and various city attorneys as well as by O. Touchstone of Dallas, attorney for the Municipal Utilities League, a utility commission bill was drawn up which leaves the large home rule cities in control of their utilities but extends to the smaller towns. It applies only to electric light and power, gas and telegraph and telephone companies. The bill does not include the indeterminate franchise clause and also omits the clause requiring a utility company to obtain a certificate of public convenience and necessity before going into a town. It contains a requirement that all new utilities shall obtain a charter from the state before operating. The act cannot be made retroactive as to utilities already operating either by charter or a permit from the state. The Governor would appoint the board of three members to have six-year overlapping terms and receive $10,000 salary.

Another measure, which affects hydro-electric power interests and seeks to fix water rights and their priority, will be introduced. The bill appropriates water for municipal and domestic purposes first, for irrigation purposes second, for industrial and manufacturing purposes third and lastly for power generation. It also provides that in all permits given for power purposes the water so appropriated shall be subject to future allocation for any of the prior purposes.

WISCONSIN.—April 23, 24 and 25 were reserved by the Legislature for hearings on bills relating to public ownership, investigation of regulation, taxation of public utilities and other League of Municipality measures. Additional bills introduced in the Assembly limit the rate to be charged for the sale of electrical energy to tenants by landlords to the rate charged by the utilities for the same service, require public utilities to file annual financial and statistical reports with the Railroad Commission and permit municipalities to install their own street lighting without applying to the commission.

A bill by Assemblyman John W. Grobschmidt, Milwaukee, would abolish the State Board of Control, the Railroad Commission and the Industrial Commission and place their duties in the hands of a state board of public welfare, to be composed of one person elected from each of the state's eleven congressional districts.

Rate Inquiry in Vermont

A study of existing electric rate structures has been undertaken by the Public Service Commission of Vermont as a result of a resolve passed by the last Legislature. The commission will survey current rates in force throughout the state, looking into their variations and the possibilities of reductions and increased uniformity. Leading power companies have been asked to file their latest rate details with the board before May 15, and the cost of the investigation has been provided for by an appropriation.

No Tri-State Delaware River Treaty in Sight

Failure of efforts spread over several legislative sessions to bring an agreement between New York, New Jersey and Pennsylvania on the apportionment of the waters of the Delaware River between the three states—a matter involving water power as well as water for other purposes—has led the city and state of New York to lays plans to tap branches of the river in New York State with the object of augmenting New York City's water supply. High legal counsel is behind the movement. The State of New Jersey, however, is moving to halt these plans by a suit in the United States Supreme Court to prohibit their execution. Pennsylvania may join New Jersey in the movement.

A treaty on water power between New Jersey, Pennsylvania and New York, ratified by New York in legislative sessions of former years, was introduced recently in the New Jersey Legislature, but no action has been taken and the measure is considered shelved. Governor Larson, in his inaugural address, leaned toward separate agreements between the states.

Osage River Plant at Bagnell, Mo., to Go Ahead

Actual work on the Missouri Hydro-Electric Power Company's long-contemplated hydro-electric development on the Osage River at Bagnell, Mo., will, the North American Company announces, follow the acquisition by its subsidiary, the Union Electric Light & Power Company, of options on the stock of the company first named. This project, to which frequent reference has been made in the ELECTRICAL WORLD, will cost in excess of $30,000,000, the North American Company says, and require two years to complete. The Missouri Hydro-Electric Power Company owns the 60,000-acre site of the proposed development, about half way between St. Louis and Kansas City. Construction of an earth and concrete dam 100 ft. in height and 2,500 ft. long will begin soon.

The power plant will have an initial generating capacity of 160,000 hp., with provision for additional generating units up to a total of 213,000 hp. With the completion of the Osage project the Union Electric system will have total generating capacity of 750,000 kw.

Two steel-tower transmission lines will connect the Osage River development with St. Louis and the lead belt centering in Crystal City. These lines will tie together two hydro-electric plants fed from distinct watersheds—the other being the Mississippi River plant at Keokuk, Iowa—as well as the Cahokia steam-electric power plant of 195,000 kw. present capacity on the Mississippi River opposite St. Louis.

Coincident with the announcement of the Osage River hydro-electric development, announcement is also made of a long-term contract which the Union Electric Company has just signed to supply all the power required by the St. Joseph Lead Company. This is one of the largest power contracts ever closed in the United States between a public utility and an industrial corporation, calling initially for 150,000,000 kw.-hr. per year. The Union company has purchased the St. Joseph Lead Company's power plant at Rivermines, Mo., retaining it for the present to supplement its facilities pending completion of the Bagnell plant.

Welding Society Awards Gold Medals at Convention

Presentation of the Samuel Wylie Miller gold medals for 1927 and 1928 was an outstanding event at the annual meeting of the American Welding Society, held in New York City this week, a tinge of melancholy being, however, added by the fact that the donor of the medal, consulting engineer of the Union Carbide & Carbon laboratory and a pioneer worker in the welding field, did not live to see the presentation, although he had personally approved both selections. The medal, which the convention recommended should be henceforth awarded in perpetuity as a memorial to its founder, is for "meritorious achievement contributing conspicuously to the advancement of the art of cutting and welding by the gas or electric processes." For 1927 it was awarded to Comfort A. Adams, past-president of the A.I.E.E. and first president of the American Welding Society, and for 1928 to James Harvey Edwards, chief engineer of the American Bridge Company, for his work on the welding of steel structures.

The opening technical session on Wednesday was devoted to a symposium on "How to Organize and Direct an Industrial Welding School."

A paper on the strength of butt welds was presented by G. Lobo, Jr., of the Westinghouse Electric & Manufacturing Company. Discussion of his paper brought out the fact that tests showing the concentration of stresses around welds are in progress at the Massachusetts Institute of Technology and the University of Pittsburgh.

Papers on Thursday dealt with applications of welding to the construction of steel structures, the heating and ventilating industries, aircraft and rail joints, while for Friday a symposium on welding in the chemical and process industries was scheduled.

F. T. Llewellyn was re-elected president and A. E. Gaynor senior vice-president. George Bird and J. S. Beall were elected vice-presidents for the Southern and Pacific Coast divisions respectively.

Purchases and Mergers

International Paper & Power Interests Here and in Canada Brought Under One Control—New Owner for People's Light & Power Corporation

FORMATION of the International Hydro-Electric System as a subsidiary of the International Paper & Power Company has brought under one control the New England Power Association and the Canadian Hydro-Electric Corporation, Ltd. Combined they have a capacity of 1,037,000 hp. in hydro-electric plants built and building, almost as much in owned water-power sites yet undeveloped and 382,000 hp. in steam-electric installations.

The United Power, Gas & Water Association has just been formed with a capitalization of $200,000,000 as a public utility holding company. It will control the Federal Water Service Corporation and the People's Light & Power Corporation. Electric light and power, water and natural-gas subsidiaries in 21 states are included. Among the first named are the Green Mountain Power Corporation of Vermont; the Arizona Edison Company of Douglas, Ariz.; the People's Arizona Gas & Electric Company, Globe, Ariz.; the Wisconsin Hydro-Electric Company, Amery, Wis.; the Northern Michigan Public Service Company, Traverse, Mich., and the West Coast Hydro-Electric Corporation, Portland, Ore.

The Union Electric Light & Power Company, subsidiary of the North American Company, has acquired options on the stock of the Missouri Hydro-Electric Power Company, which owns the 60,000-acre site of the proposed development on the Osage River at Bagnell, Mo., about midway between St. Louis and Kansas City, referred to on page 847.

The Connecticut Public Utilities Commission has approved a joint petition of the Litchfield Electric Light & Power Company and the Washington Electric Light & Power Company to merge the assets and franchises of the two companies.

The London (Ohio) City Council has awarded the power franchise for that city to the Ohio Edison Company, Springfield, after a four months' contest between the Springfield company and the Central Utilities Company of Sedalia, Ohio. A referendum on the Council's action may be held. The Ohio Edison agreed to pay the city $75,000 for the latter's share in the London distributing plant and power equipment. A power company operated by London men which had held the franchise previously was sold to the Ohio Edison recently, as reported on March 23 (page 605).

One of the latest acquisitions of the Alliance (Ohio) Power Company is the Hilo (Hawaii) hydro-electric plant, purchased, with the gas plant, at a cost of $2,200,000. Its acquisition followed a recent visit of President E. W. Sweezy to Hawaii.

A proposal by the Interstate Power Company of Dubuque, Iowa, to purchase the Owatonna (Minn.) municipal electric and heating plant was shelved by the City Council last week. The company offered $650,000 to the city for the plant and franchises which would allow it to operate over a stipulated period. It operates the Owatonna gas plant.

Sale of the machinery of the Wakonda (S. C.) municipal electric plant has been authorized by the voters, paving the way for abandoning municipal ownership and operation.

The sale of Wisconsin water powers at Rosholt, Nelsonville, Amherst, Amherst Junction and Custer, in Portage County, and the power at Cobtown, Waupaca County, to Insull interests has been announced. The Wisconsin Valley Electric Company, Wausau, had also negotiated for the purchase of these properties.

An offer of $375,000—exceeding the offer of the Appalachian Electric Power Company by $100,000—for the Radford (Va.) municipal plant has been made to the City Council by the president of another large utility company, according to announcement made by Radford city officials. This offer, they say, comes from a company already operating many plants of high financial rating and long established, but the City Council seems indisposed to consider a sale at the figure named. A third utility company is thought to have become interested.

A certificate merging the Morris Light & Power Corporation with the New York State Electric Corporation has been filed with the Secretary of State at Albany.

The Brooklyn (N.Y.) Edison Company has bought the electric distribution system and business of the Gerrittsen Electric Company and will take over the supplying of electric service to Gerrittsen Beach, which is in Brooklyn Borough, on May 1.

The Oshawa (Ontario) City Council has definitely decided to submit to the electors of the city at the earliest possible date the question of the purchase of the local electric distributing system from the Hydro-Electric Power Commission of Ontario.

Strong efforts are being made by outside capital to purchase the electric light plant and street railway of Edmonton, Alberta. The Canadian Utilities, Ltd., a subsidiary of the International Utilities, offered $1,268,000 for them and the Canadian Water Works & Electric Company, it is reported, offered $6,138,000 for the same utilities. The Council notified both companies that the utilities are not for sale. The Calgary Power Company has an offer for an interchange of power, the city to buy its power from the company during high-water period, which would be for about six months of the year, the company then to buy as much of the city's steam-generated power during the winter time as it might need. The proposed rate for this interchange of power is 0.65 cent per kilowatt-hour. Calgary is 180 miles distant.

Five power companies submitted tenders for the purchase of the Kamloops (B. C.) power plant and distribution system, as follows: National Bond & Discount Company, Portland, Ore., controlling West Canadian Hydro-Electric Company, Vernon, B. C., $562,000; British Columbia Electric Railway Company, Vancouver, B. C., $585,000; Canadian Utilities, Ltd., Calgary, Alberta, $530,000; Dominion Electric Company, Regina, Saskatchewan, $605,000; Canadian Waterworks & Electric Company, Vancouver, $800,000.

Development of hydro-electric power near Port Alberni, B. C., will be commenced in the near future if the ratepayers of Alberni and Port Alberni approve a bylaw to be submitted by the City Council for sale of the municipal power plant. The National Utilities Corporation of Spokane, Wash., has made an offer of $125,000 cash for the existing system and a 25-year light and power franchise.

Quick Restoration of Alabama Plants Injured by Flood

The ELECTRICAL WORLD is informed that the River Falls Power and Pea River Power companies, reported in its issue of March 30 to have been put out of commission by the southern Alabama floods, were quickly restored to service and in a remarkably short time after the inundation were taking care of virtually all their customers except at Elba, the town that was almost destroyed. The fact that, as the ELECTRICAL WORLD stated, it was only the earth embankments at the ends of the dams that were swept away made this quick restoration possible. The concrete structures themselves stood fast, and any possible implication in the former note that the destruction was so great that these companies would not be able soon, if at all, to resume business was unwarranted.

Franklin Lighting Specification Explained by S.E.D.

In explanation of the "Franklin specification" for commercial and industrial lighting which is now being promoted on a national basis under the direction of a technical subcommittee of the commercial and industrial lighting committee of the Society for Electrical Development, of which subcommittee E. D. Tillson, Commonwealth Edison Company, Chicago, is chairman and A. A. Brainerd of Philadelphia, J. Carl Fisher of Baltimore, Ward Harrison of Cleveland, S. G. Hibben of Bloomfield, N. J., and A. L. Powell of Harrison, N. J., are members, a full statement has been issued by the S.E.D. It reads in part as follows:

The "Franklin specification for good lighting" is a simplified and direct method for laying out the general lighting of factories, stores, offices, public buildings and other non-residential interiors.

It takes into account the major factors that enter into the proper design of a lighting installation, viz., the use that will be made of the interior, as the distinction between a place where fine work is carried on and a place where coarser operations are in process; the proportions of the room, that is, its width as related to its height; the color of the upper walls and ceiling; the probable maintenance the lighting equipment is likely to receive, and so on.

It is based on the research and applied lighting science developed by the large lamp companies, equipment manufacturers and the professional lighting engineers.

The Franklin specification is the product of study and conference by a national technical committee consisting of the lighting engineers of the three large lamp companies and of those heading the lighting department of several large central-station companies. Acting on the recommendation of this national committee of lighting authorities, the board of directors of the Society for Electrical Development has approved the specification as a national standard and requested the management to promulgate it.

Dallas Regional Meeting

Southwest District of A.I.E.E Has Prepared an Admirable Program for the Technical Gathering in the Lone Star State Next Month

OIL pipe line electrification, a matter of special local interest, will be one of the topics to come before the Southwest regional meeting of the American Institute of Electrical Engineers at Dallas on May 7 to 9. Other subjects include alternating-current networks, bare-wire distribution, interconnection, lightning research and effect of lightning on transformers, reclosing high-voltage circuits, remote metering, electrical features of waterworks and the lighting of flying fields and airways Two student sessions will be held, one in the afternoon of May 7 and one in the morning of May 8, and a prize cup will be awarded for the best among ten papers presented by students. Entertainment and inspection trips will be provided in plenty, and on the evening of the first day S. P. Grace of the Bell Telephone Laboratories will lecture on telephone science and research.

For the four technical sessions these papers are planned:

TUESDAY, MAY 7

Morning. — "Developments in Network Systems and Equipment," T. J. Brosman and Ralph Kelly, Westinghouse Electric & Manufacturing Company; "Standard Voltage Alternating-Current Network," John Oram, Dallas Power & Light Company; "Automatic Reclosing of High-Voltage Circuits," E. W. Robinson and S. J. Spurgeon, Alabama Power Company.

WEDNESDAY, MAY 8

Morning.—"Bare-Wire Overhead Distribution Practice," M. C. Miller, Texas Power & Light Company; "Interconnection in the Southwest," G. A. Mills, Central & Southwest Utilities Company; "Electrification of Oil Pipe Lines in the Southwest," D. H. Levy, Magnolia Petroleum Company; "Selective Remote Metering Equipment," R. J. Wensley, Westinghouse Electric & Manufacturing Company.

THURSDAY, MAY 9

Morning.—"Progress in Lightning Research," F. W. Peek, Jr., General Electric Company; "Lightning Studies of Transformers by the Cathode-Ray Oscillograph," F. F. Brand and K. K. Palueff, General Electric Company; "Flying-Field and Airway Lighting," R. Odgen, U. S. Army; "Electrical Features of the New Kansas City Waterworks Plant," A. L. Maillard, consulting engineer.

Afternoon. — "Meeting Long-Distance Telephone Problems in the Southwest," H. R. Fritz and H. P. Lawther, Southwestern Bell Telephone Company; "Railway Train Signal Practice," P. M. Gault, Missouri Pacific System; "Telephone Transmission Networks," T. E. Shea and C. E. Lane, Bell Telephone Laboratories, "Program Transmission Over Telephone Circuits for National Broadcasting," F. A. Cowan, American Telephone & Telegraph Company.

Turners Falls Company's New Contract with Westfield

Following competitive bidding for the contract to supply electrical energy to the city of Westfield, Mass., the Turners Falls Power & Electric Company, holder of the existing contract, has entered into a six-year agreement beginning July 1 on a new basis, waiving the last year of the old contract at a higher rate.

The new price will be according to the Hopkinson scale, as follows: $1.75 per kilowatt demand per calendar month, plus 9 mills per kilowatt-hour, plus standard coal clause based on $8 per gross ton and the increase of five-thousandths of a mill for each 1-cent increase on gross tons, plus $4,000 per year for station operation. In the event that the city is not satisfied with the results forthcoming under the Hopkinson scale, the option is offered of a base rate of 14 mills and no station charge. If application is made by the city before August 1, 1930, for the application of this base rate for the year beginning July 1, 1929, the company will refund any sum charged in excess of what would have been incurred under the base rate of 14 mills. The number of kilowatt-hours for the year beginning July 1 is estimated at 12,000,000 and the kilowatt demand at 2,500.

Grounding Rules Redrafted by N.F.P.A.

Electrical Committee Report on Revisions of National Electrical Code Ready for Consideration at Memphis Next Month—Portable Equipment Discussed

A COMPREHENSIVE codification of grounding practice in interior wiring systems has been prepared by the electrical committee of the National Fire Protection Association for consideration at the annual meeting of that body in Memphis, Tenn., May 13-16 inclusive. Article 9 of the 1928 National Electrical Code has been redrafted with the object of harmonizing previous differences of viewpoint upon this subject, and various provisions of wide interest have been set forth in connection with the grounding of portable equipment. Section 908 of the 1928 code, relative to the grounding of portable equipment in industrial establishments, has been omitted in its entirety, and in general mandatory grounding has been confined to portable lamps and appliances operating in hazardous locations. Where portable motors operate at more than 150 volts to ground, guarding or grounding of frames is mandatory, and it is recommended that the frames of portable motors which operate at less than 150 volts be grounded when this can readily be accomplished.

The 1928 code provides that in industrial establishments portable devices having exposed metal parts used in industrial operations shall be equipped with a cord containing an additional insulated and readily identifiable conductor to be used for grounding only, or with metal armor; with a non-reversible polarized attachmentt plug; with a connection between the grounding pole and the frame, and with a grounded pole receptacle. This regulation applies to many portable motor-driven tools, light heating devices and other easily handled shop equipment. Fan motors, pressing irons and devices ordinarily out of reach, infrequently handled or regularly employed in non-conductive locations, are exempted. The omission of this section (908) from the new draft leaves the coast clear for the use of devices without grounding except in hazardous locations, and the redrafted code establishes a voltage operating limit above which portable motors must either be guarded or frame-grounded, viz., 150.

In the revised draft the text is clarified in connection with the setting forth of approved methods of obtaining ground connections where a water-piping system, a system ground conductor or a secondary neutral grid is not available. Non-ferrous rods are included in approved forms of electrode construction, and the former requirement in urban and suburban districts of a grounding conductor inclosed in insulated conduit or molding where the resistance to ground exceeds 3 ohms is omitted. In the grounding of interior wiring systems a clause is added to the effect that where such a system is not electrically connected to exterior conductors the grounding connection shall be made at the transformer, generator or other source of supply, or at a switchboard, and on the supply side of the first switch controlling the system.

Non-corrodible material of equivalent conductance may be substituted for copper wire in grounding interior wiring systems, and for grounding equipment and devices there may be used the metal inclosures of the wires which supply them or separate grounding wires run in wire assemblies with the circuit conductors. Methods of securing electrical continuity of conduit systems used for grounding equipment on circuits operating with any conductor at more than 150 volts to ground are clarified. Grounding wires smaller than No. 4 must now be inclosed against mechanical injury if within 7 ft. of the floor, compared with 5 ft. in the 1928 code. The size of wire or pipe used for grounding service and interior conduit is tabulated in more detail in the revision, with specification of No. 0, No. 00 and No. 000 instead of No. 2 copper for the heavier classes of service. Approved plugs of other material than brass may be used in attaching ground conductors to pipes and fittings, if ground clamps are not employed.

Provisions of Ohio's New Commission Law

Under the provisions of the Ohio public utility law, as amended at the recent legislative session, a utility requesting a decrease in rates will be permitted to file the schedule proposed with its application to the Public Utilities Commission. If the application is for an increase, the utility must

file a detailed inventory and appraisal of its property, operating statement for the last fiscal year, and income and expenses anticipated under the application, and advertise the substance of the application for three weeks in a paper in the territory in which the utility operates.

The division of investigation of the utilities commission will then proceed to detail an attorney-examiner or other expert to make an investigation of the utility's application and operation, unless the commission desires to hold a hearing on the matter at once. Copies of the investigator's report will go to the applicant, mayors of municipalities affected and others interested. If no objection is raised within 30 days, the commission will hold a final hearing within ten days thereafter. If objection is raised by any one, the application must be sent for final hearing before an attorney-examiner or before the commission. Hearings may not be suspended for more than three days at a time. It is presumed that decisions under the new law will be prompt, although no time limit for arriving at a decision is placed on the commission.

Southeastern Men Adopt Program for Asheville

Scarcely will the echoes of the convention of the Southwestern Division of the N.E.L.A. at Hot Springs, Ark., have died away before the Southeastern Division will assemble at the Grove Park Inn, Asheville, N. C., for its seventeenth annual convention, to be held on May 8, 9 and 10. The opening general session on Wednesday morning is, according to the preliminary program, to be addressed by Corporation Commissioner I. M. Bailey of North Carolina, President C. A. Collier of the Southeastern Division, President P. S. Arkwright of the national body, James L. Madden, vice-president Metropolitan Life Insurance Company, whose subject is to be "Migration of Industry," and Nap H. Boynton, National Lamp Works, who will tell about "Light's Golden Jubilee."

In the afternoon the Accounting, Commercial and Engineering Sections will hold separate sessions. "The 'How' of Accounting," by S. T. Grady, Georgia Power Company, is the chief paper scheduled for the accountants; P. B. Zimmerman will discuss refrigeration, George Jaquet selling lighting and A. Edwin Fein "Merchandising Psychology" before the commercial men, while at the engineering meeting L. W. W. Morrow will talk on system planning, F. V. Andrea on the electrochemical industry and A. H. Harding on preferred voltage ratings for alternating-current systems.

Four men from outside the industry —Walter B. Wilbur, attorney, of Charleston, S. C.; LeRoy E. Kern, architect; C. F. Kettering, vice-president General Motors Research Corporation, and Dr. Gus Dyer, dean of business economics, Vanderbilt University, Nashville—will address Thursday morning's general meeting on subjects pertinent to the industry. They will be followed by Managing Director Paul S. Clapp of the N.E.L.A. On Friday morning John G. Jones, vice-president Alexander Hamilton Institute, will speak on "Why Engineers Should Be Business Men," L. H. Beall of Sears, Roebuck & Company on tying merchandising and operating together, Stewart L. Minns of the J. Walter Thompson Company on market development, and Harry M. Hitchcock of *Printers' Ink* on better advertising.

Great Lakes Engineers

Discuss Reliability of Transmission at More than 100 Kv. and Comparative Costs of Erecting Pole Lines by Hand and Machine.

ABOUT two hundred engineers gathered in Chicago, April 18 to 20, for the first 1929 meeting of the Engineering Section, Great Lakes Division, N.E.L.A. All of the sessions were well attended, but those of the overhead systems and underground systems committees appeared to be most popular. A notable contribution to the work of the former committee was the report on reliability of transmission lines of more than 100 kv. This report tabulated line outages according to their significant classifications and should be a valuable index of performance in determinations of design. Another matter that excited much interest and discussion was a comparison between manual and machine costs in pole-line erection. Both of these themes will be treated at greater length in later issues.

The underground systems committee was mostly occupied with problems of duct-line and manhole construction and with means to assure perfection in making cable joints. The experience of the Detroit Edison Company with shielded cable and its solution of the distribution of electrostatic stresses in joints on this cable excited interest. An excellent series of still and motion pictures of labor-saving and cost-cutting machinery used in its underground construction was presented by the Commonwealth Edison Company.

Meter schools and other educative activities were live topics with the meter committee, as was also that perennial subject of discussion—outdoor meters. The electrical apparatus committee considered the progress so far made on the assembly of a map showing transmission lines in the Great Lakes region, the purpose being to provide an easy source of reference when interconnections between systems are in consideration. The hydraulic power committee discussed the project, originating in the national body, for the appropriation of a sum of money for the development of test methods on hydro-plant performances. A large part of the time of all committees was devoted to acquainting the local members with national committee doings.

Engineering Foundation Asks for $7,000,000

The annual report of the Engineering Foundation, just made public by Director Alfred D. Flinn, says that experience is showing year after year the actual usefulness and the much greater possibilities of this joint research organization of the four senior national engineering societies with their 60,000 members.

"Research interests of engineers are not restricted to so-called material things," the report says. "Improvement of the facilities for living and communicating lifts life steadily to higher intellectual, moral and spiritual levels and promotes health, happiness and brotherliness. The engineer's studies must include the effects of his technical activities upon his fellow humans and their social organization. Since 1915 the Engineering Foundation's capital funds have grown from $200,000 to $620,000 and its income from less than $10,000 a year to more than $30,000. This small income has been supplemented by cash, services, materials and facilities, worth in the aggregate several times as much, contributed to projects which the foundation has aided."

The committee is seeking $5,000,000 for the Engineering Foundation and $2,000,000 for the Engineering Societies Library by direct gifts of cash or securities, bequests, life insurance, annuities, living trusts or installment contributions.

Beauharnois Company at Work for St. Lawrence Plant

The Beauharnois Light, Heat & Power Company, which has a charter from the Province of Quebec for a power project on the St. Lawrence between Lakes St. Francis and St. Louis, the plans for which were approved by the federal government on March 8, has established an office in Montreal. A syndicate is being formed to finance the undertaking. A block of the securities will, it is anticipated, be sold in England. According to plan, the securities will be placed on the market during the coming summer. President Frank P. Jones is in England in the interest of the company. Robert O. Sweezy, author of the enterprise, is discharging the duties of managing director.

The material and construction equipment for the project will be assembled on the ground in preparation for operations next spring. Camps and accommodation will be made ready so that no time will be lost once the spring opens in 1930. It is planned that preliminary construction work will be in progress by July 1 of this year. Work on the main canal will be started early in 1930. The construction of the main power house and remedial work to insure a steady flow of water within the speed of 2.25 ft. per second, as specified in the government order, will not be completed until the summer of 1932. By November of that year it is

planned to have four units of 50,000 hp. in operation. It is expected that the entire project will take about four years to complete.

Section 19 of Water-Power Law Construed

Chief Counsel of Federal Power Commission Interprets Jurisdiction of That Body in Interstate Commerce and in States Without Regulatory Bodies

RESPONDING to a request from Executive Secretary O. C. Merrill of the Federal Power Commission for an opinion on the jurisdictional powers of that body as laid down in and affected by Section 19 of the water-power law, Major L. W. Call, chief counsel for the commission, recently interpreted the law as bestowing upon it jurisdiction over rates and services of public service corporations or agencies as far as these are connected with interstate or foreign commerce. This jurisdiction also extends to the securities of licensees of the commission, to subsidiary corporations whose stock is owned or controlled directly or indirectly by a licensee, and to persons, associations and corporations purchasing power from a licensee for distribution or use in public service.

The ruling also holds that the commission's jurisdiction over intrastate commerce in electrical energy within any state may be exercised only to the extent, and as long as, the state has not provided its own agencies of regulation, and that it extends to licensees of the commission and to their customers only in so far as they are engaged in the public service and only to the extent that the acceptance of such jurisdiction is a contractual obligation enforceable on the parties. That is to say that the federal government, having authority to grant or refuse permits for the exploitation of water power affecting navigable streams, can grant these permits in return for an agreement by the company that it will observe regulation by the Federal Power Commission until such a time as the state sees fit to do its own regulating. Thus is born the contractual relationship between the government and the utilities.

The ruling holds, further, that the statute imposes a duty upon the commission to exercise its jurisdiction to regulate rates, services and securities whenever complaint is filed by any person aggrieved or when request is made by any state concerned and that, under such circumstances, it is not within the discretionary authority of the commission to decline to exercise jurisdiction.

"In the case of rates charged or services rendered by a public service corporation subject to the jurisdiction of the commission," the opinion says, "any person whose pecuniary interests are affected would be entitled to file complaint with the commission, and if such complaint make a prima facie showing to such effect, the commission must take jurisdiction."

Briefer News

WISCONSIN UTILITIES ASSOCIATION ELECTS OFFICERS.—G. W. Van Derzee, vice-president and assistant manager of the Milwaukee Electric Railway & Light Company, has been unanimously elected president of the Wisconsin Utilities Association, by mail ballot. M. H. Frank, Wisconsin Power & Light Company, Fond du Lac, was elected vice-president and Ewald Haase treasurer. They will take office early in May.

FLOODLIGHTING AN ELEMENT IN BUILDING DESIGN.—Inasmuch as floodlighting recommendations for it were made prior to the construction of the building, and since all outlets were ar-

ranged in conformity with a layout prepared by illuminating engineers, the floodlighting of the Fisher Building, Detroit, has been made especially effective. The building surface is entirely of marble and of sufficiently rough surface to take floodlighting readily. The edifice was adapted for night illumination by the use of setbacks for locating the 530 General Electric floodlamps.

DATE SET FOR CAMP CO-OPERATION IX.—R. Bourke Corcoran, chairman of the League Council, announces that Camp Co-operation IX will be held on August 2 to 6. As usual, this gathering of electrical leagues will be at Association Island, Henderson Harbor, N. Y.

MUNICIPAL POWER PLAN REJECTED BY SANTA CRUZ VOTERS.—By a vote of 2,656 against and 1,856 for, the voters of Santa Cruz, Calif., on April 16 rejected the proposal made by the People's Construction Company of San Francisco, which offered to build a power plant on the San Lorenzo River and transmit power to the city to be distributed by the municipality. Under the plans proposed the city would have entered into a contract to buy electrical energy for a period of 40 years and at the end of that time the plant would have reverted to the city. The community is now served by the Coast Counties Gas & Electric Company.

A THIRD DAM ON SHENANDOAH RIVER IS PROJECTED.—Options are said to have been obtained by agents of the Page Power Company, which already has two dams in operation on the Shenandoah River in Page County, Va., and also by A. A. Roudabush of Shenandoah, a stockholder in other power projects, for the construction of another dam on that stream, in the Springfield district.

CAPACITY OF NEW EL PASO STEAM PLANT TO BE 40,000 KW.—When completed the steam plant now being constructed by the El Paso (Tex.) Electric Company, plans for which were previously announced, will have a total capacity of 40,000 kw. A new 25,000-kw. unit is to be installed in the plant, and as soon as it is ready a 15,000-kw. unit will be removed there from the present power plant. The old plant then will be used for standby service.

SANTIAM RIVER PROJECT OPPOSED.—The Santiam Fish and Game Protective Association is preparing a formal protest against the granting of the application of the Northwest Power Company of Portland, Ore., for a permit to develop hydro-electric power projects at Marion Lake and along the Santiam River. The opponents base their protest on the grounds that the construction of dams in the district will injure a valuable scenic attraction and prove disastrous to the life of game fish in both the lake and river.

DIXIE POWER COMPANY OF UTAH AUTHORIZED TO BUILD PLANT ON VIRGIN RIVER.—Authority to build the additional hydro-electric plant planned by the Dixie Power Company on the Virgin River, near La Verkin, Utah, has been granted by the Public Utilities Commission of the state. The plant will cost approximately $90,000 and its installed generating capacity will be 1,100 hp. This power will be used to supplement the output of other plants supplying service in Washington and Iron Counties.

PUBLIC OWNERSHIP UNLIKELY TO BE ISSUE IN MINNEAPOLIS MAYORALTY ELECTION.—Efforts to inject the issue of public ownership of utilities into the Mayoralty campaign now beginning in Minneapolis have made small headway, three candidates having declared against it, while only one, a woman, favors it. "The time has passed when a candidate for office can ride into power by denouncing a public utility without presenting some constructive policy," said John R. Coan, regarded as a leading candidate. "The demand for public ownership in this community is not insistent. The policy, for the next

two years, at least, will be private ownership under proper control and regulation."

NINETY-YEAR-OLD DAM HELPS WISCONSIN COMPANY. — The Wisconsin Power & Light Company has added to its system a small hydro station at Beloit rated at about 600 hp., replacing one to be dismantled. The new plant is fed from a reservoir formed by a dam built 90 years ago. It adjoins the company's steam plant.

EXPANSION PLANNED AT OTTUMWA, IOWA.—The Iowa Southern Utilities Company of Ottumwa has announced an addition to the local power plant to cost $300,000. Work will begin May 1 and will take ten months or more to complete. The building will be of steel and brick construction, and three boilers will be installed.

MISSOURI'S PUBLIC SERVICE COMMISSION HAS NEW CHAIRMAN. — Governor Caulfield of Missouri has named Milton R. Stahl, a St. Louis lawyer, to be chairman of the Public Service Commission of the state. He succeeds Almon Ing of Poplar Bluff as chairman, Mr. Ing, however, retaining his membership on the commission. Dudley Calfee of Jefferson City retires. J. P. Painter of Milan, originally a recess appointee; John H. Porter of St. Louis and S. M. Hutchinson of Kansas City complete the board.

PENNSYLVANIA RAILROAD NOW HAS PLAN FOR UNDERGROUND TRANSMISSION THROUGH BALTIMORE. — The Pennsylvania Railroad is about to submit to the Baltimore authorities a plan for electrification that will be satisfactory to the municipality, the railroad's local counsel say. The municipality has made it a condition for approving the railroad's program that overhead wires be not used in the residential portion of the city, and, as previously reported, this led to a hitch in the agreement for electrification of the railroad in Baltimore.

RIVALRY IN SERVING JACKSONVILLE SUBURB.—The city of Jacksonville, Fla., has made a proposal to the municipality of South Jacksonville, across the river, to supply it with energy at the rate of 1½ cents per kilowatt-hour for a period of twenty years and to bear one-half the cost of erecting a new substation in the latter city. The South Jacksonville Utilities Company, which figured in the preliminary negotiations, did not present a definite proposal. A representative of the Dupont interests asked whether the Council would entertain offers to purchase the distribution system and was told this was unlikely.

GAS COMPANY MAN WOULD HARMONIZE GAS AND ELECTRIC SERVICE.—Co-operation instead of competition between gas and electric companies in promoting the sale of their respective products and services was urged at a convention of the Midwest Gas Association in Minneapolis last week by Louis Stein, retiring president, who directed his plea particularly to companies that manufacture and distribute both electricity and gas. He urged that such companies promote the sale of one or the other product on a basis of real superiority and do not recommend both for the same purposes.

MAINE LIGHT AND POWER COMPANIES TO MAKE INDUSTRIAL SURVEY.—President Walter S. Wyman of the New England Public Service Company has announced an industrial survey of the territory served by the Central Maine Power Company, the Cumberland County Power & Light Company and the Berwick & Salmon Falls Electric Company, a district that includes 180 cities and towns in Maine between the Penobscot River and the New Hampshire line. The survey, designed to determine the industrial potentialities of the section, is to start at once and will be conducted by the Lockwood-Greene Engineers, Inc. It is expected to require from three to four months, with conferences scheduled in each municipality visited.

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see issue for January 5, page 80.]

Southwestern Division, N.E.L.A. — Arlington Hotel, Hot Springs, Ark., April 30-May 3. S. J. Ballinger, San Antonio Public Service Co., San Antonio, Tex.

Arkansas Utilities Association — Arlington Hotel, Hot Springs, Ark., April 30-May 3. R. I. Brown, Arkansas Power & Light Co., Little Rock, Ark.

Indiana Electric Light Association — Hotel Gary, Gary, Ind., May 1-3. William Stokes, 1548 Consolidated Bldg., Indianapolis, Ind.

American Institute of Electrical Engineers—Regional meeting, Dallas, Tex., May 7-9; summer convention, Swampscott, Mass., June 24-28. F. L. Hutchinson, 33 West 39th St., New York.

East Central Division, N.E.L.A. — Louisville, Ky., May 7-10. D. L. Gaskill, Greenville, Ohio.

Southeastern Division, N.E.L.A.—Asheville, N. C., May 8-10. C. M. Kilian, 207 Bona Allen Bldg., Atlanta.

Missouri Association of Public Utilities —Bothwell Hotel, Sedalia, May 16-18. F. D. Beardslee, 315 N. 12th St., St. Louis.

National Electrical Credit Association —Statler Hotel, St. Louis, May 16 and 17. F. P. Vose, 1008 Marquette Bldg., Chicago.

National Electrical Manufacturers' Association — The Homestead, Hot Springs, Va., May 20-25. S. N. Clarkson, 420 Lexington Ave., New York.

American Electrochemical Society—Toronto, May 27-29. C. G. Fink, Columbia University, New York.

National Electrical Wholesalers' Association—The Homestead, Hot Springs, Va., May 27-31. E. Donald Tolles, 165 Broadway, New York.

National Electric Light Association—Atlantic City, N. J., June 3-7. A. J. Marshall, 420 Lexington Ave., New York.

North Central Electric Association—Breezy Point, Pequot, Minn., June 16-18. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

Association of Iron and Steel Electrical Engineers—Pittsburgh, June 17-21. J. F. Kelly, 1007 Empire Bldg., Pittsburgh.

Canadian Electrical Association — Algonquin Hotel, St. Andrew's by the Sea, N. B., June 19-21. H. M. Lyster, 712 Power Bldg., Montreal.

Pacific Coast Electrical Association—Del Monte, Calif., June 19-22. S. H. Taylor, 447 Sutter St., San Francisco.

Society for the Promotion of Engineering Education—Ohio State University, Columbus, June 19-22. F. L. Bishop, University of Pittsburgh, Pittsburgh.

Northwest Electric Light and Power Association—Seattle, June 26-29. B. Snow, 1206 Spalding Bldg., Portland, Ore.

FOSHAY WINS THIS BOUT.—The W. B. Foshay Corporation of Minneapolis, which has been waging a battle with the Ontario Hydro-Electric Power Commission for the right to sell electrical energy to the people of Bruce County in western Ontario, won a victory on April 15 when the ratepayers of Brant Township voted in favor of the corporation's offer to supply power. To the corporation, as represented by the Walkerton Electric Light & Power Company, a franchise has been granted to construct a distribution system throughout the township. Votes are to be taken in other municipalities during the course of the next few months. (See ELECTRICAL WORLD for April 6, page 703.)

WOMEN'S SECTION OF EMPIRE STATE ASSOCIATION TO MEET ON MAY 2 AND 3.—Meeting at Ithaca, N. Y., on May 2 and 3, the Women's Section of the Empire State Gas and Electric Association will be addressed by Dean Dexter S. Kimball, Industrial Survey Commissioner Merwin K. Hart, Frank W. Smith, President Charles S. Ruffner of the association, Miss Martha Van Rensselaer, director College of Home Economics, and others. At a banquet on Thursday evening Mrs. Travis H. Whitney will speak on the topic "A Woman Looks at the Public Utility." Rural service will be one of the topics on the second day.

LIGHTING NEW BRIDGE ON SAN FRANCISCO BAY.—San Francisco Bay, from San Mateo to Hayward, is now spanned by a bridge more than seven miles long and wide enough to accommodate comfortably three lanes of traffic. The bridge, said to be the longest of its kind in the world and constructed at a cost of $7,500,000, is of the low-level type and is virtually a complete causeway. Designed for use at night as much as by day, the problem of lighting it was solved by mounting on top of the concrete bridge railing, about 200 ft. apart in staggered formation, 177 General Electric incandescent street-lighting units on "union metal" octagonal posts. The mounting height is approximately 14 ft. from the road surface to the light center. The lights are operated from individual transformers mounted on the bridge structure below the roadway and incased in copper because of the proximity of the salt water. Several miles of concrete highway approach have been constructed at each

end of the bridge. Along these highways General Electric lighting units are mounted at 300-ft. intervals on 4-ft. brackets 30 ft. high.

OSWEGO RIVER REGULATION NEEDED FOR POWER PRODUCTION.—Floyd L. Carlisle, speaking in Oswego, N. Y., recently, pointed to the need of a storage reservoir on the Oswego River. Not one-third of the water which flows down the valley, he said, can be used profitably in power. Were $1,500,000 to be expended in the upper reaches, there would be no spring floods and the river could be used 365 days in the year in the generation of electricity. Mr. Carlisle blamed state officials for the delay in development under existing laws and said that the plants his companies had built on the river could not be operated 200 days a year at present.

PASSAMAQUODDY BAY TIDAL PROJECT SEEKS MORE TIME.—A request from the Dexter P. Cooper Company for an extension of time for two years in which to commence a tidal power project on Passamaquoddy Bay, between the Province of New Brunswick and the State of Maine, was refused by the private bills committee of the Canadian House of Commons on April 16. The proposal is to harness the tidal waters of Passamaquoddy Bay, producing an initial development of 400,000 hp. or 500,000 hp., the cost of which will be very high in the millions. The project is being vigorously opposed by the fisheries interests.

ALLIANCE (OHIO) POWER COMPANY ENLARGING GENERATING PLANT.—New equipment which will increase the capacity of the plant 150 per cent is being installed by the Alliance (Ohio) Power Company, a subsidiary of the Utilities Service Company, at a cost of $400,000. A 15,000-kva. turbogenerator is in process of installation. In less than three years business has doubled, according to E. W. Sweezy, president of the Utilities Service Company. The plant now operates a 10,000-kva. unit and furnishes energy for the Stark Electric Railroad Company and rural lines of the Suburban Light & Power Company, in addition to serving factories in the Alliance district. A 23,000-volt line is being constructed between Alliance and Canton, a distance of 19 miles.

MINNESOTA POWER & LIGHT WILL SPEND $1,100,000 ON IMPROVEMENTS.—Improvements to the properties of the Minnesota Power & Light Company at a cost approximating $1,100,000 have been authorized for the current year. Forty-one new items are budgeted with appropriations also for the completion of seventeen started in 1928. At Duluth the Commerce Street substation in the downtown district will be reconstructed and extensive improvement of the underground distribution system begun, besides many other expenditures. Among the plans for the company's territory outside Duluth are construction of a 33,000-volt loop line into Wadena and erection of a substation there, improvement of the Hewitt-Verndale, Cuyuna-Little Falls, Mesaba Range and other transmission lines and of distribution systems in many places.

WEST TEXAS TRANSMISSION LINES CONTINUE TO GROW.—An expansion of its transmission lines in west Texas is being carried out by the West Texas Utilities Company. It has approximately 200 miles of lines of wooden-pole construction now under way, and since January 1 it has completed 70 miles of new line to the pump stations of the Shell Pipe Line Company and the Texas Pipe Line Company. The towns of Christoval and Blackwell were added to the company properties, increasing the number of cities, towns and communities reached by the West Texas Utilities Company in the 42 counties it serves to 110. Among the major extensions are the building of a 66,000-volt line, with the necessary substations, from San Angelo to Eldorado, a distance of 36 miles, and the construction of 30 miles of 66,000-volt line from Sonora to Ozona. This will close a 66,000-volt loop between San Angelo and Ozona. Of equal importance is the construction of 28 miles of 66,000-volt line from Mason to the Gillespie County line to interconnect with the Central Power & Light Company, thus providing loop service to towns in that district. Extensions to oil fields has meant also the reinsulation of 300 miles of 22,000-volt line for 66,000 volts between Menard and Junction.

Recent Court Decisions

PERMISSION FOR SURRENDER OF POWERS BY COMPANY THREATENED WITH EXHAUSTION OF ASSETS HELD PROPER. — The Supreme Court of Pennsylvania has confirmed the action of a lower court in granting a petition from the Bangor Electric Company for permission to surrender certain of the powers conferred by its charter on the ground that not to do so would exhaust its assets. The company had originally been authorized to supply electric power "and heat by means of exhaust steam necessarily generated by the electric plant." The company's plant burned down in 1927, previous to which the electric railway companies which had been its principal customers had ceased to operate. It determined to construct a plant by which it could supply live steam to those who had theretofore been receiving exhaust steam and to purchase from a neighboring electric company enough energy to supply its remaining electrical customers. This deviation from the terms of its charter, opposed by Bowers et al., was permitted by the court. (145 At. 128.)*

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

STRICT COMPLIANCE WITH LAW GOVERNING TRANSFER OF CITY FUNDS INSISTED ON IN CASE AFFECTING MUNICIPAL PLANT. —The voters of Central City, Neb., sanctioned the transfer from the city's lighting fund to a fund to build a city hall of a sum "not to exceed $10,000," and the City Council thereupon entered into a contract appropriating $10,540 as the amount to be thus transferred. The Nebraska Supreme Court (Moore vs. Central City) says that, "although no estimate or appropriation was a prerequisite to authorize such use, because the money in question was not derived from taxation," the contract was void because it was in excess of the $10,000 voted, "thereby establishing a dangerous precedent that cannot be sanctioned."

Commission Rulings

HOLDING-COMPANY FEE DISALLOWED AS NOT PROVED TO REPRESENT SERVICE.—In a rate hearing for the St. Croix Valley Telephone Company the Wisconsin Railroad Commission disallowed an operating expense of $1,200 paid to a holding company because cost to the holding company was not established. The commission said: "In several cases the commission has taken the attitude that it would allow as operating expenses of the subsidiary only such charges for holding-company service as could be substantiated by evidence of cost to the holding company for rendering such service. No testimony has been offered to substantiate the claims of the subsidiary in this respect, and for the purposes of this case the $1,200 payment will not be allowed as operating expense."

PUBLIC SERVICE COMPANY MUST OBTAIN CAPITAL TO PERFORM SERVICE IT UNDERTAKES.—The Community Power Company of St. Louis, owner of the Gothenburg Light & Power Company, has been ordered by the Nebraska State Railway Commission to offer to land owners within the area in which it has obtained an appropriation of water for irrigation-ditch purposes the alternative of purchasing permanent water rights or of accepting service at such reasonable rates as may be satisfactory to users and the commission. The commission holds that there is abundant water for all the complainants who own land within the appropriation area, and as permanent water rights have been sold others, the company cannot deny similar service to the remaining owners. Delivery must also be at the borders of the land, and purchasers may not be required to build their own laterals. Answering the contention of the company that it is not prepared to finance the improvements and repairs asked for, the commission says that: "It is the duty of a public service company to secure necessary capital to perform the service it undertakes. The business of an irrigation company is transportation of water, and it must secure the capital for the facilities necessary for the performance of that service. . . . The fact that the defendant may not have the ready means at hand does not relieve it of this obligation. It has refused to sell at any price, and there is no showing that it has made any attempt to raise money either by the sale of stock or by borrowing, both of which it has the right to do upon proper showing to this commission."

News About Men of the Industry

G. W. Van Derzee Heads Wisconsin Association

G. W. Van Derzee, who was elected president of the Wisconsin Utilities Association, as announced elsewhere in this issue of the ELECTRICAL WORLD, has been actively identified with the public utility industry in the Middle West for a number of years. Following graduation from the University of Wisconsin in 1908 Mr. Van Derzee spent some time in graduate work and on the teaching staff at the Houghton School of Mines and later he joined the sales forces of the General Electric Company with headquarters in Milwaukee.

His first work with the Milwaukee Electric Railway & Light Company was in power sales and he shortly became assistant to S. B. Way, then vice-president. After Mr. Way became president of this company, Mr. Van Derzee was made vice-president and assistant general manager, the position he occupies at the present time.

Mr. Van Derzee has been active in the commercial and public relations work of his company and had considerable to do with developing rural rates and in extending rural electric service in the territory served by the Milwaukee utility. In his present position he has general supervision over the advertising, commercial, rate accounting, purchasing and stores and publicity departments. Mr. Van Derzee had much to do with arranging the programs for some of the recent conventions of the Wisconsin Utilities Association and in late years he has been actively interested in the National Electric Light Association and the Association of Edison Illuminating Companies.

R. J. S. PIGOTT, who for three years was mechanical engineer with Stevens & Wood, Inc., and later consulting engineer with the Public Service Production Company, Newark, N. J., and the Smoot Engineering Corporation, has returned to the Stevens & Wood organization as consulting mechanical engineer. For several years Mr. Pigott was chairman of the main research committee of the American Society of Mechanical Engineers and has had wide experience with industrial and power plants. In his new assignment he will devote his time mainly to solving the problems of industrial companies both in matters of power and production.

J. B. COYNE of Winnipeg was added to the board of directors of the Manitoba Power Company at the annual meeting held at Winnipeg on April 1.

HON. SENATOR J. M. WILSON of Montreal was elected a director of the Montreal Light, Heat & Power Consolidated to succeed the late Sir Lomer Gouin.

J. M. SEAY, vice-president and comptroller of the New York Power & Light Corporation, was elected a vice-president of the Mohawk Hudson Power Corporation at a recent meeting of the board of directors.

THOMAS N. MCCARTER was re-elected president of the Public Service Corporation of New Jersey and subsidiary companies for the twenty-seventh time at the annual meeting of the directors held April 23.

WILLIAM E. WILMOT, who has been connected with the Puget Sound Power & Light Company since 1900, has severed his connection with that organization to become treasurer of the reorganized Tacoma Railway & Power Company.

J. E. RIDER of the University of Michigan and formerly connected with the New York Edison Company, has joined the engineering organization of Gannett, Seelve & Fleming, Engineers, with headquarters in Buenos Aires.

J. H. CLARK, prior to the reorganization of the Los Angeles Department of Water and Power executive assistant to E. F. Scattergood, chief electrical engineer, has been named executive assistant in the department.

BARRY DIBBLE, for the past year connected with the Commission Nacional de Irrigacion of Mexico, has returned to Redlands, Cal., where he has opened offices as consulting engineer. While he was identified with the commission Mr. Dibble devoted his attention especially to making studies of power possibilities on several irrigation projects.

JULIUS KLEIN, director of the United States Bureau of Foreign and Domestic Commerce since 1921, has been appointed Assistant Secretary of Commerce by President Hoover. Mr. Klein is a Californian by birth and a recognized authority on commercial and trade matters. He is a regular contributor to periodicals on the subject of foreign trade and on economic and commercial problems.

C. H. Shaw Receives New Appointment

Carroll H. Shaw has been made general superintendent of the transmission and distribution department of the New York Edison Company, through an executive order of President Matthew S. Sloan. This position places him in charge of most of Manhattan's street lighting system, including all the area south of 136th Street and part of the Bronx. He also has supervision over all activities connected with the installation and maintenance of overhead and underground wires and cables.

Mr. Shaw is nationally known to pub-

lic utility men as chairman of the underground systems committee of the National Electric Light Association during 1926 and 1927. He was employed by the New York Edison Company in 1920 as engineer of the distribution and installation department, after having been sent by Jackson & Moreland, engineers, of Boston, to study the company's underground system. Born in Abington, Mass., April 2, 1888, he was graduated from Massachusetts Institute of Technology in 1910, and removed to Cleveland, Ohio, where he was employed four years in the engineering department of the National Lamp Works of the General Electric Company. Then he was made electrical engineer of the Sheboygan Electric Railway Company, Wisconsin. In 1916 he was made manager of the Minnesota Utilities Company, Eveleth, Minn. Following the war he became commercial representative of the New England Power Company, Worcester.

BURTON M. RIKER, industrial electric heating engineer in the commercial and industrial department of Charles H. Tenney & Company, Boston, Mass., has been appointed head of a newly organized commercial and industrial department of the Rockland Light & Power Company, a property under Tenney management with headquarters at Nyack, N. Y. Mr. Riker was the

winner of the James H. McGraw prize for the best essay on industrial electric heating in 1928 and has served the cause of industrial heating in the Tenney syndicate with marked distinction during the past three years.

C. E. GROESBECK, president of the Electric Bond & Share Company, has been elected a director of the Bankers Trust Company.

A. N. WOODHEAD, formerly assistant secretary of the Mohawk Hudson Power Corporation, has been elected secretary of that organization. Mr. Woodhead is also assistant secretary of the New York Power & Light Corporation.

O. L. JOHNSTON, a member of the law firm of Simpson, Thacher & Bartlett, New York, has been elected a vice-president of the Mohawk Hudson Power Corporation. The law firm of which Mr. Johnston is a member is counsel for the Mohawk Hudson corporation.

A. J. GATES has recently been elected vice-president of the Baker-Raulang Company, this promotion following closely his appointment as director of sales of the industrial truck division of the company, as announced last December. Mr. Gates brings to his new position twenty years experience in industrial sales work. After graduation from the electrical engineering school of Purdue University, Mr. Gates spent nine years with the General Electric Company as a sales engineer before joining the Baker organization. For eleven years he has represented his present company in the Cleveland and Detroit territories.

A. W. ROBERTSON, who has served for the past two and one-half years as president of the Philadelphia Company and who recently was elected chairman of the board of the Westinghouse Electric & Manufacturing Company, has been relieved of his executive duties as president of the Philadelphia Company and affiliated corporations. Halford Erickson, vice-president of H. M. Byllesby & Company, stated that until further action of the board of directors of the Philadelphia Company Thomas Fitzgerald, vice-president Pittsburgh Railways Company, will direct the operation of all the transportation companies; C. S. Mitchell, vice-president, will be in charge of all accounting matters of the Philadelphia Company and affiliated companies and F. R. Phillips, vice-president, will direct the operations of all other companies in the Philadelphia Company system.

FRANCIS MCQUILLIN of Pittsburgh has been appointed industrial sales manager of the West Penn Power Company, to succeed Thomas S. Henderson, who died recently. Mr. McQuillin will have charge of the industrial sales department. Removing from England to New York in 1910, Mr. McQuillin was for three years engineer with the New York Railways Company and the New York Edison Company. In 1913 he became vice-president and chief engineer of the Maintenance & Improvement Company of New York. In 1916 he served as electrical engineer on one of the utility subsidiaries of the American Railways Company at Huntington, W. Va. His association with the West Penn System began in 1918 on the Monongahela properties of the company and in 1923 he joined the West Penn Power Company as power engineer. He is a member of the American Institute of Iron and Steel Electrical Engineers.

STEPHEN C. BUNTING, who has been connected with the New York Power & Light Corporation since 1921, has been made manager of the newly acquired Montgomery Electric Light & Power Company with headquarters at Canajoharie. Mr. Bunting was formerly manager of the Port Henry Light, Heat & Power Company and previous to that connection he was manager of the Mountain division, having been located at Warrensburg. He was also electric superintendent at Amsterdam for some time.

WILLIAM E. WOOD, president of the Virginia Electric & Power Company, Richmond, who has been on a brief pleasure trip to Europe, arrived in New York aboard the Lloyd-Sabaudo liner *Conte Grande*. Mr. Wood remained in New York for a few days on business of the Richmond utility before returning South. He sailed on the *Berengaria* on March 8 from New York and spent most of the time in Germany and Spain.

H. T. BURNAM, formerly assistant to the general superintendent of light and power of the El Paso Electric Company, has been made agricultural engineer in the sales department of the company. Mr. Burnam has been connected with the El Paso utility since 1921.

Obituary

William E. Keily

William E. Keily, for years Western editor of the ELECTRICAL WORLD and more recently engaged in special work for Samuel Insull, died April 23, of angina pectoris, at his home in the Webster Hotel, Chicago, after an illness of only three days. Throughout his career Mr. Keily devoted his attention especially to literary and consulting work having to do with public utility problems and relationships. In 1891, after obtaining a broad background in

newspaper work in the capacity of reporter on various dailies, Mr. Keily entered the field of technical journalism. He became managing editor of the *Western Electrician* in 1899, but when the paper was sold in 1908 Mr. Keily resigned. A short period of free-lance work followed and early in 1909 he became Western editor of the ELECTRICAL WORLD, the position he retained until 1915. Among Mr. Keily's most recent activities were the editing of Samuel Insull's books on "Central Station Electric Service" and "Public Utilities in Modern Life." He was the author of numerous articles and pamphlets, including "Electricity the Burden Bearer." Mr. Keily was an associate member of the American Institute of Electrical Engineers, Western Society of Engineers, American Association for the Advancement of Science, Illuminating Engineering Society and other similar organizations.

JOSEPH BOUSSINESQ, a leading French authority on hydro-dynamics and the utilization of water power, died recently in Paris at the age of 87.

PAUL BIZET, managing director of the Compagnie Générale d'Electricité, Paris, died recently at Montigny-les-Cormeilles, France, in his sixty-first year. Mr. Bizet took a prominent part in the development of electricity supply in France and was a strong advocate of the linking up of generating stations and distribution systems.

JAMES M. GLASTER, assistant secretary of the International General Electric Company, died at his home in Schenectady, N. Y., April 19, of pneumonia. Mr. Glaster had been connected with the General Electric Company at Schenectady for about 30 years and formerly had been employed at the Boston and Lynn, Mass., branches of that organization.

P. W. ELLIS, one of the pioneers in the development of the hydro-electric system of the Province of Ontario, Canada, died in Toronto, April 21, as the result of an operation. Mr. Ellis, who was interested in various public and private enterprises, was chairman of the Toronto Hydro-Electric System, of the Toronto Transportation Commission and of the Queen Victoria Park (Niagara Falls) Commission. He was the first president of the Canadian Manufacturers' Association and had served as vice-chairman and treasurer of the Ontario Power Commission.

Financial and Statistical News

Energized Dollars in the Power Industry*

By Preston S. Arkwright
President National Electric Light Association

DOLLARS invested in the electric light and power industry attain greatest usefulness because they aid in the achievements of every activity served by the facilities they provide. Their use multiplies their usefulness.

The usual work they do makes their own survival more assured. Their safety and their earning power are secured by the diversity of the enterprises dependent upon the services they render.

For every dollar invested in constructing the facilities of an electric light and power company it is estimated that the resultant expenditures of capital in activities utilizing such service will be $6.50. The dollar, therefore, invested in the electrical industry not only renders its own work, but it leads into useful service six and a half of its fellows. It is a working dollar not only, but a leader of working dollars as well. The employment of one individual in the operation of an electric light and power company leads to the employment of forty-seven additional individuals in the various enterprises dependent upon its service, besides giving to each of the forty-seven, on the average, the strength of forty more. Each dollar paid in salary and wages in the operation of an electric light and power company leads to the payment of forty-one additional dollars in salaries and wages to the workers in the enterprises dependent upon it.

The return on the capital invested in the facilities of an electric light and power company is the larger part of the cost of its product. The capital, therefore, is entitled to the major portion of the credit for the achievement. Its share of the work is of comparatively greater usefulness than falls to the lot of capital in most other lines of business. This likewise leads to greater security for the capital invested. The earnings necessary to support it are not as dependent upon the individual employee. The loss of the manager, no matter how skillful he may have been, does not imperil the investment.

The basis of the capital of the electric light and power company is physical property. Its securities are not issued upon intangibles such as trademarks, good will, public taste, individual preference. It is converted into durable structures. Its earnings flow from its use and not from its consumption, or its destruction, or its sale. It doesn't deplete itself. The capital remains intact. Its useful work is long continued. Dollars set at this task stay at the task. There are no heavy inventory shrinkages of raw materials or produced goods to fear. The substantiality of the assets gives further security to the investment.

P. S. Arkwright

The work of the electric light and power company is performed under the public eye. Its business is transacted on a public map. The state possesses and exercises visitorial powers over it. Its records of accounts are open books. Statements in detail of its transactions are filed with and subjected to examination by governmental agencies and are open to public inspection. It can have no secrets. Accurate information of its condition is always available. Its policies, its activities, the type of its management, its progress or lack of it, are common knowledge. Any one in the community can know whether the electric light and power company is being properly conducted and what measure of success it may be achieving in its operations.

No matter how well secured an investment may be; no matter how great the assurance of the return of the principal and the payment of the interest, there are circumstances and conditions frequently arising making it desirable for the individual investor to convert his securities back into cash. Generally there is a broad market for the bonds and stocks of the electric light and power companies, and usually it is possible for the holder of these securities to convert them into cash as the need arises, without delay and at nominal expense.

**From an address by Mr. Arkwright as guest speaker on the Halsey, Stuart & Company radio program April 18.*

General Gas & Electric Shareholders Advised of Purchase Details

SEVERAL details concerning the recent acquisition of the General Gas & Electric Corporation by the Associated Gas & Electric Company are explained in a letter sent last week to shareholders of the former by H. C. Hopson, vice-president of both organizations. The transaction is of special interest in view of the strategic position of the General Gas & Electric properties with relation to the proposed Atlantic Seaboard tie-up of utilities allegedly under the sponsorship of the Morgan-Mellon banking interests.

The chief factors of interest in this letter are the statements that the Associated system had secured direct control of Binghamton Light, Heat & Power, Metropolitan Edison, New Jersey Power & Light, Northern Pennsylvania Power and certain smaller companies now in process of being merged with them and also that Associated Gas & Electric had acquired an additional 170,000 class B voting shares of General Gas & Electric, increasing its majority from 60 per cent to nearly 80 per cent.

Attention is also called to the continuous accumulation of General Gas & Electric stock by the United Gas Improvement Company. According to its annual statement the latter company now holds 83.7 per cent of the class A common shares, 35.3 per cent of the class B common and 78.5 per cent of the dividend participation, giving it an interest of about 59 per cent in the corporation's earnings applicable to common stocks and dividend participation.

Following the announcement of the sale of the corporation to the Associated Gas & Electric Company, Mr. Hopson's letter states, accumulation of the stock by a competing interest continued, and this "caused your directors to question whether it would be possible for your company permanently to finance the requirements of all of its operating subsidiary companies to enable them to meet demands for public service which are continuous, constantly increase and cannot be postponed without endangering their business.

"Your directors therefore negotiated the sale of the securities of the operating companies in question to Associated Gas & Electric interests, which are amply able to finance their future requirements and with whose properties the properties of these operating companies had previously been con-

nected or were in process of connection. This was consummated on a basis which we believe to have been very attractive to your company from every standpoint."

Following the sending of the letter by the Associated Gas & Electric Company steps were taken by the United Gas Improvement Company to obtain through court action information concerning the acquisition of the 170,000 shares of class B voting stock of the General Gas & Electric Corporation by the Associated Gas & Electric Company.

Canadian Hydro-Electric Makes Output Records

Canadian Hydro-Electric Corporation, Ltd., controlled by the International Hydro-Electric System, a subsidiary of the International Paper & Power Company, produced 166,904,000 kw.-hr. of electric energy in March, two and one-third times the output of the corporation in March, 1928, and the second highest production for a single month, being exceeded only by that in January. Industrial activity in Canada in the first three months was maintained at a high level and preliminary reports indicate that business was on a greater scale than in the first quarter of last year. There was a larger movement of merchandise in production, importation and distribution than a year ago. Comparatively few branches of industry operated below the high levels of last year, and in both value and volume commercial activity made new high records.

SWISS COMPANY TO MAINTAIN LOCAL CONTROL.—The Motor Columbus Gesellschaft für Electrische Unternehmungen of Baden is submitting a scheme to the shareholders for an increase of capital from $15,000,000 to $18,700,000. In order to maintain Swiss control of the company $2,000,000 of the new capital is to be offered to the existing shareholders, while it is announced that the bulk of the balance of $1,700,000 will be reserved in $10 shares for Swiss investors. It is also proposed to alter the articles of the company in order to provide that at least two-thirds of the directors shall be of Swiss nationality.

Full Normal Rise Shown in February Operations

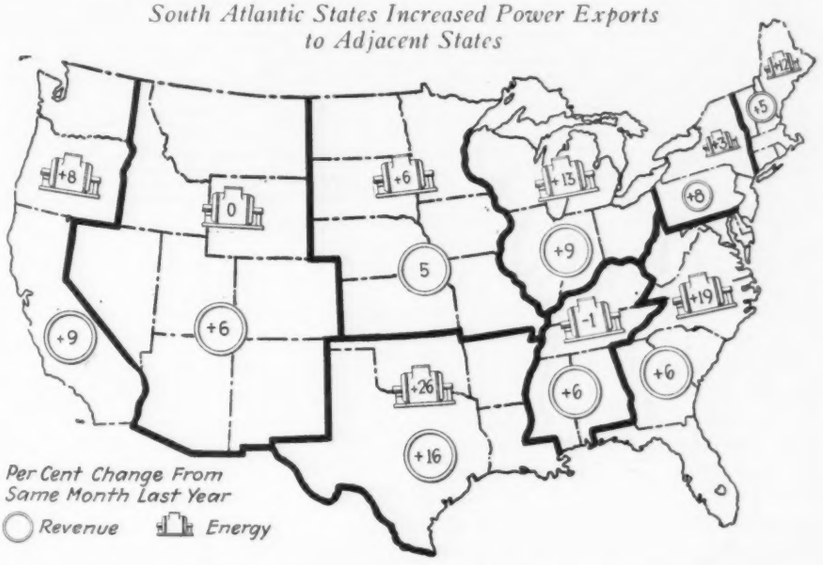
Energy Output 7,061,730,000 Kw.-Hr.—Daily Average 14 per Cent Greater than in 1928—Revenue, $174,900,000, Is up 7.6 per Cent

THE shortest month of the year, bringing in the revenue for energy consumed in the preceding long winter month, is expected to bring the peak of average daily income. This year that daily average reached $6,240,000, which was 11.3 per cent more than in 1928. The total for the month was $174,900,000, 7.6 per cent above that in 1928, according to monthly reports from electric light and power companies received by the ELECTRICAL WORLD. Operating expenses, amounting to $67,800,000, were 5.6 per cent higher.

The energy output for the month, 7,061,730,000 kw.-hr., exceeded last year's February record by 10.3 per cent and was equivalent to an average of 252,000,000 kw.-hr. per day. On the latter basis the rate of increase is 14 per cent. This is the true measure of change; since 1928 was a leap year the two monthly records are not directly comparable as a whole.

These daily averages may also be set against the computed normals, $6,299,000 and 241,200,000 kw.-hr., respectively, based on past history, and indicated by the dashed line on the chart. The actual revenue missed the estimated normal by only a very slight margin, which may be wiped out when fuller returns are available. The energy output continues well above the trend line. It broke away in April, 1928, and has consistently stayed above it with the exception of the slight dip in December. In February the excess was more than 4 per cent.

South Atlantic States Increased Power Exports to Adjacent States



The wide margin by which the energy production has, month by month, surpassed that of 1928, as recorded in Table III and in the chart, is undoubtedly to be ascribed mainly to general industrial activity, even after due account is taken of the steadily increasing use of motor drive.

The deficiency of water power noted in recent months continues strongly in evidence. The actual output from this

Table I—Central-Station Financial Operations in the United States

Compared with Corresponding Month of Previous Year

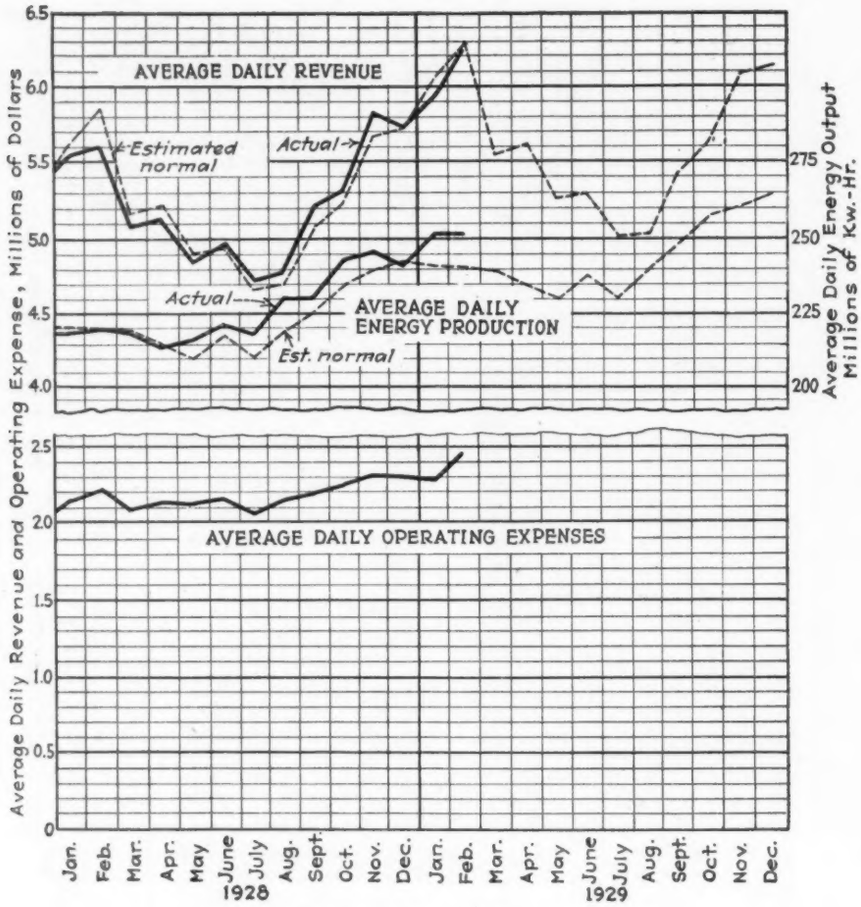
Month	Total Gross Revenue from Sale of Energy*			Total Operating and Maintenance Expense†		
	1928 Thousands	1927 Thousands	Per Cent Inc.	1928 Thousands	1927 Thousands	Per Cent Inc.
November	$174,800	$158,200	+10.5	$69,200	$64,300	+7.6
December	177,600	165,100	+ 7.6	71,400	67,900	+5.1
	1929	1928		1929	1928	
January	184,400	171,700	+ 7.4	71,600	66,700	+7.3
February	174,900	162,300	+ 7.6	67,800	64,200	+5.6

Table II—Central-Station Fuel Consumption in the United States‡

Compared with Corresponding Month of Previous Year

Month	Coal		Oil		Gas	
1928	Short Tons	Per Cent Increase	Barrels	Per Cent Increase	Thousands Cubic Feet	Per Cent Increase
November	3,438,485	+ 6.2	596,133	+23.1	7,418,675	+31.6
December	3,539,733	+ 6.0	814,151	+30.5	7,117,843	+48.0
1929						
January	3,798,777	+14.4	601,305	+ 7.2	7,916,919	+60.0
February	3,392,040	+ 8.6	820,683	+57.4	7,219,749	+47.5

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.
†Do not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions. ‡As collected by U. S. Geological Survey.



All Daily Averages Show February Peak

source, 2,398,625,000 kw.-hr., was 2.6 per cent smaller than it was a year ago, a most unusual condition. Whereas in some months of 1928 it constituted over 40 per cent of the total, it has now fallen to 34 per cent. Consequently the output from fuel had to be increased by more than 700,000,000 kw.-hr., rising to 4,663,105,000 kw.-hr., and requiring an increase of 8.6 per cent in coal consumption, 57.4 per cent in oil and 47.5 per cent in natural gas. The actual quantities of fuel are given in Table II.

Regionally the greatest increase, both in revenue and in energy output, occurred in the Southwest. Next come the East North Central and Pacific states. In the last named the energy gain was only 8.3 per cent, but the scarcity of water was so serious that the amount generated from fuel had to be multiplied threefold. It would be difficult to find a better example of the necessity of having an adequate reserve of thermal station capacity. Table IV gives further details on the regional operations. The effect of Conowingo, not in operation a year previously, and of other developments in the South Atlantic group can be definitely traced in the figures for that and adjacent sections.

Table III—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1928	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
November	7,377,887	+13.2	2,718,520	+10.2	4,659,367	+15.0	1,327,000	+ 7.9
December	7,505,377	+10.2	2,693,095	— 0.1	4,812,282	+17.0	1,348,000	+10.3
1929								
January	7,802,676	+15.2	2,625,364	+ 0.6	5,177,312	+24.6	1,260,000	0
February	7,061,730	+10.3	2,398,625	— 2.6	4,663,105	+18.3	1,135,000	— 7.0

Table IV—Regional Operations, Revenue and Energy Output in February, 1929

Compared with Corresponding Month of Previous Year

Region	Revenue		Energy Generated, Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	174,900	+ 7.6	7,061,730	+10.3	2,398,625	— 2.6	4,663,105	+18.3
New England	16,040	+ 5.3	472,259	+12.1	156,491	—20.2	315,768	+40.6
Middle Atlantic	48,920	+ 7.8	1,694,317	+ 2.9	454,819	—11.0	1,239,498	+ 9.1
East North Central	40,730	+ 9.0	1,830,841	+13.5	176,940	— 2.4	1,653,901	+15.5
West North Central	13,540	+ 4.9	402,737	+ 5.8	110,876	— 4.5	291,861	+10.3
South Atlantic	19,820	+ 6.0	892,362	+19.4	446,561	+34.8	445,801	+ 7.1
East South Central	7,810	+ 6.2	281,482	— 1.5	233,256	+ 6.3	48,226	—32.8
West South Central	9,910	+16.1	358,911	+26.7	8,137	+83.1	350,774	+25.8
Mountain	6,970	+ 5.7	273,671	— 0.2	216,732	— 8.6	56,939	+61.6
Pacific	14,060	+ 9.0	855,150	+ 8.3	594,813	—15.8	260,337	+200.0

*As collected by U. S. Geological Survey.

Carolina Utility Makes Eight-Million-Dollar Offering

First and refunding mortgage gold bonds of the Carolina Power & Light Company to the amount of $8,000,000 were offered April 23 at 99 and interest. These 5 per cent bonds were dated April 1, 1926, and mature April 1, 1956. Proceeds will be used to reimburse the company for expenditures made for additions to property and for other corporate purposes.

Fall River Utility Passes to New Hands

Control of the Fall River Electric Light Company has been jointly acquired by the New England Power Association and Eastern Utilities Associates. Fall River stockholders have been given option to exchange for each share of $25 par Fall River stock either two-thirds of a share of 6 per cent New England Power Association preferred stock of $100 par value or $66⅔ principal amount of three-year 4½ per cent convertible gold notes of Eastern Utilities Associates. This offer is open until May 15, inclusive, and exchange will be made July 1. The Fall River Company has been interconnected with the New England Power System about ten years and is a participating owner of the Montaup Electric Company, together with the Blackstone Valley Gas & Electric Company and the Edison Electric Illuminating Company of Brockton. Eastern Utilities Associates is a Stone & Webster holding company controlling Brockton, Blackstone Valley and Abington & Rockland companies. President Roy F. Whitney of Fall River Company states that the present management set-up will continue.

STAMFORD UTILITY INCREASES DIRECTORATE.—The Stamford Gas & Electric Company, Stamford, Conn., has been granted a charter amendment providing for an increase in the number of directors from nine to fifteen and an increase in capital stock to $10,000,000.

Business News and Market Conditions

High Rate of Activity Continues

March Activity in Electrical Manufacturing Plants 28.6 per Cent Over Last Year— Seasonal Decline Sets In

THAT the electrical manufacturing plants of the nation are operating on a high plane and materially above this time last year is indicated by reports received by the ELECTRICAL WORLD on the monthly consumption of electrical energy by a large proportion of these plants. The rate of productive activity in these plants during March was about 2.3 per cent under that witnessed during February. It is perfectly normal for the activities of the electrical manufacturing plants to record a decrease in the previous month at this season of the year, but this downward trend in past years has generally started one month earlier than was the case this year, and the decrease recorded this year is much less than in previous years. In other words, the operations of the industry are holding much better than in former years.

As compared with March last year the figures are most encouraging. The current March rate of operations was 28.6 per cent over March, 1928, one of the largest twelve-month gains recorded by the industry. The average rate of activity for the first quarter of the current year was 19.4 per cent over the same period last year.

The index of activity in the electrical manufacturing industry based upon consumption of electrical energy stands at 148.3 for March, as compared with 151.8 for February and 115.3 for March last year. Comparative indexes of productive activity referred to the average activity for the period 1923-25 as 100 and adjusted for number of working days are shown in the accompanying table.

March, 1929	148.3
February, 1929	151.8
January, 1929	131.3
December, 1928	135.3
March, 1928	115.3
Average first quarter 1929	120.6
Average first quarter 1928	143.8

Action to Protect Users of "Sunshine" Lamps

Manufacturers of carbon arc lamps, better known as "sunshine" lamps, recently organized as a section of the National Electrical Manufacturers' Association, have taken action to protect the public against fraudulent or misleading claims in advertising.

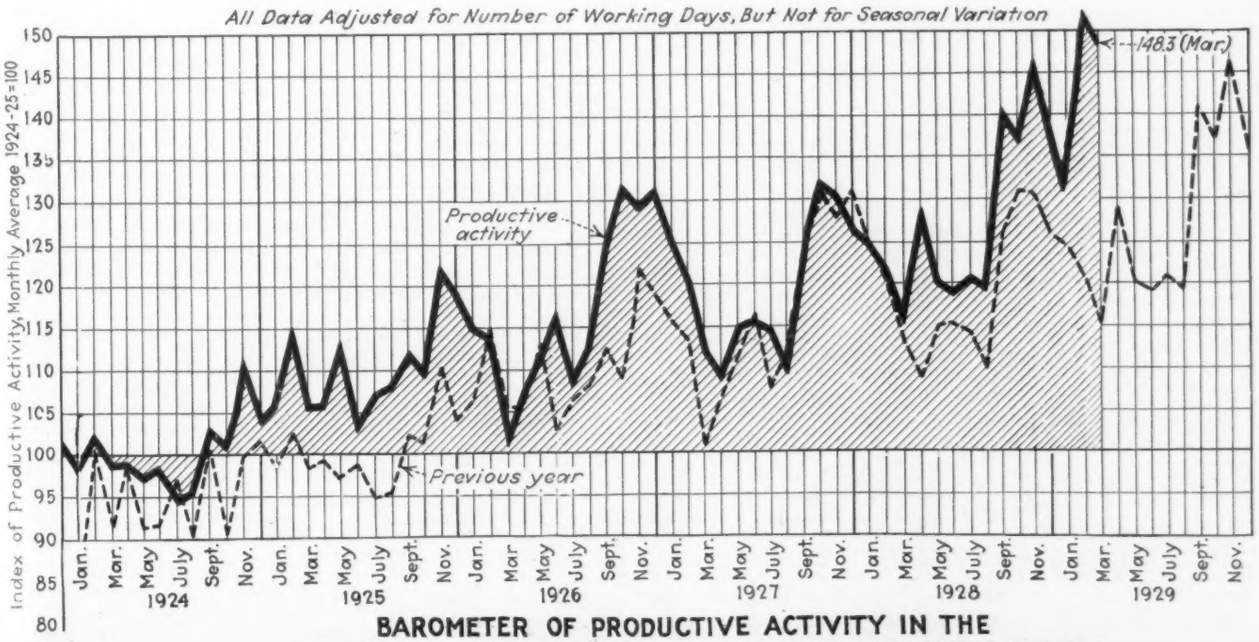
In a resolution just adopted by the carbon arc lamp section of N.E.M.A. it is stated that "in advertising and printed matter dealing with carbon arc lamps for sale to the public curative claims shall be limited to building health to higher levels and as an aid in preventing common systemic disturbances."

These lamps employ the type A carbon and duplicate sunshine. The resolution is designed to discourage self-diagnosis and establish the thought that, in the treatment of specific diseases, carbon arc lamps should be used with the advice of a physician.

New York Organizes for Market Development

The electrical industry of New York City is embarking upon a broad program of business promotion and market development. At a special meeting at the Hotel Astor on Wednesday action was taken by the combined membership of the New York Electrical League and the Electrical Board of Trade of New York to merge these two organizations to form the Electrical Association of New York, Inc. The Electrical Board of Trade has been a trade service organization working in the fields, of credit information, collections, business difficulty adjustments and recovery of stolen property. The work of the league has been largely the promotion of better fellowship with the industry, holding monthly luncheon meetings, at which the attendance averages 750, and providing a community Christmas tree each year in Times Square.

The new association will continue and expand this work and in addition enter actively into market development and the improvement of local industry policies and trade practice. Earl Whitehorne, assistant vice-president of the McGraw-Hill Publishing Company and president of both the Electrical League and the Electrical Board of Trade, will become president of the Electrical Association of New York, Inc. The other officers of both organizations will also carry on. They are as follows: Theodore H. Joseph, William A. Kennedy,



BAROMETER OF PRODUCTIVE ACTIVITY IN THE ELECTRICAL MANUFACTURING PLANTS OF THE UNITED STATES

Clarence L. Law, A. Lincoln Bush, Lawrence L. Strauss and David T. Brown.

Refrigerator Manufacturers Vote to Join N.E.M.A.

Twelve of the leading electric refrigerator manufacturers, whose combined output is approximately 70 per cent of the industry's production, have voted to disband the Refrigeration Manufacturers' Council and join the National Electrical Manufacturers' Association as the refrigeration division. This reorganization, which is signaled by the manufacturers as the first step in an extensive program of industry development, was unanimously sanctioned at a meeting of the Refrigeration Manufacturers' Council held in Detroit on April 16, at which representatives of the following companies were present:

Absopure Refrigeration Corporation, Climax Electric Refrigerating Company, Copeland Products, Inc., Dole Refrigerating Machine Company, General Electric Company, Holmes Products, Inc., Kelvinator Corporation, Norge Corporation, Peerless Ice Machine Company, Servel, Inc., Universal Cooler Corporation and Westinghouse Electric & Manufacturing Company.

T. K. Quinn, manager of the electric refrigerator department of the General Electric Company, has been appointed chairman of the new N.E.M.A. refrigeration division, which will be divided into domestic refrigeration and commercial refrigeration sections. George W. Mason, chairman of the board and president of the Kelvinator Corporation, will head the former section, while John D. Hallowell of the Dole Refrigerating Machine Company will serve as chairman of the latter group. The executive committee of the division, composed of the chairman of the division and the chairmen of each of the two sections, will hold its first meeting in Cleveland on May 7. The next meeting of the division will be held during the spring meeting of the association at Hot Springs, Va., on May 31.

Dullness Continues to Feature Metal Markets

Inactivity and the absence of consumers' demand featured the major nonferrous metal markets during the past week. In this respect the situation is but little changed from that existing in the period immediately preceding the week under review. Copper appears fairly firm at 18 cents delivered Connecticut Valley.

NEW YORK METAL MARKET PRICES

	Apr. 17, 1929 Cents per Pound	Apr. 24, 1929 Cents per Pound
Copper, electrolytic	18	18
Lead, Am. S & R price	7.00	7.00
Antimony	9.50	9.44
Nickel, ingot	35	35
Zinc, spot	6.95	6.975
Tin, Straits	45.50	44.875
Aluminum, 99 per cent	24.30	24.30

Base copper wire price April 24, 1929 19½ cents.

Market Conditions

FIRST QUARTER sales of electrical equipment, as discussed elsewhere, are up sharply from the first quarter of 1928. Leading manufacturers anticipate a satisfactory second quarter.

——THE ENTIRE EAST reports very favorably on the state of business and the outlook. Small motors are active in New England and the Eastern district reports interest in domestic appliances, substation and line materials, etc.

——MOTORS AND CONTROL APPARATUS are in active demand further west.

——ON THE PACIFIC COAST demand for turbines, transformers, etc., from power companies is active, but there is something of a lull in other branches of industry.

Central-Station Buying Active in Southeast

Few individually large orders are reported for the Southeast, but the total volume of business remains satisfactory. Activities are somewhat off, but this is to be expected when we consider that anticipated price increases were responsible for the unusually good volume of sales a few weeks back. The largest central-station order was for boiler plant equipment going into a Georgia company's new steam station and this equipment aggregated $550,000. A company in the Carolinas ordered $80,000 worth of weatherproof and bare copper wire and a company in Alabama will this coming week buy two carloads of weatherproof and one car of bare copper wire. A Georgia company's orders for creosoted pine poles were in excess of $17,000 and its distribution and small power transformer orders approximated $11,000. Some other power company orders were for $6,300 worth of crossarms, $2,700 worth of submarine cable and $2,000 worth of arrester equipment. Orders are in immediate prospect covering $50,000 for suspension insulators and $50,000 for lightning arresters. A cotton bag mill in Alabama ordered $14,000 worth of tex rope drive, while a rayon plant in North Carolina bought varnished lead-covered cable and rubber-covered wire amounting to $2,500. Construction projects are as follows:

The Appalachian Electric Power Company, Bluefield, Va., plans a power substation at Roanoke, Va. Chattanooga, Tenn., plans a floodlighting system and beacon lamps for its municipal airport. The Wheeling Corrugating Company, Wheeling, W. Va., plans a storage and distributing plant at Memphis, Tenn., to cost $225,000. The Standard Oil Company, Columbia, S. C., will build a local oil storage and distributing plant, with mechanical shop, to cost $160,000. The Greenville Insulating Board Corporation, Greenville, Miss., will build a local mill to cost $100,000. The Virginia Bridge & Iron Company, Roanoke, Va., plans a mill at Birmingham, Ala., to cost $1,500,000. The Alabama Tire & Rubber Corporation, Huntsville, Ala., plans a mill to cost $850,000. Mobile, Ala., plans an electric power plant for municipal waterworks service, to cost $400,000. The Southeastern Engineering Company, Birmingham, Ala., plans a transmission line from Rockcastle to Tuscaloosa, Ala., about 22 miles. The Westcott Hosiery Mills, Dalton, Ga., will build an addition to cost $100,000. Miami, Fla., plans a floodlighting system and beacon lamps for its municipal airport. The Miami Aircraft Corporation, Miami, Fla., plans a plant to cost $200,000.

Business Moves Upward in Eastern District

The month is concluding with satisfactory business in the Eastern district and indications point to a continuance of the present substantial volume of orders. Both central station and industrial demand show strength. Inquiries are increasing for miscellaneous equipment, particularly in the line of domestic appliances and specialties. Power companies are in the market for substation and line materials. A maker of high-tension insulators reports business as brisk. A central station in New Jersey has placed an order for transformers for a power plant now in the course of construction, to cost $65,000. A Maryland utility company has contracted with two Pennsylvania manufacturers for steel towers, cable and conductors for a transmission line. A Pennsylvania maker of power equipment has secured an order for a turbo-generator, switchboard and auxiliary equipment for a municipal station in Missouri and for a large prime mover installation of similar type for a central station in Texas. A New York manufacturer has taken a contract from a Pacific Coast power company for a turbo-generator unit with accessories to cost $1,000,000.

The call for switchgear and affiliated apparatus shows an upward trend. A power interest in Kentucky has ordered a quantity of oil circuit breakers from a New York maker to cost $50,000. A metropolitan utility company has contracted for network protectors to an amount of $58,000. Meter account continues on a reduced level. A New Jersey power company has placed a contract for a quantity of outdoor meters to cost $50,000. Wire and cable account carries little change. Industrial motors are in active call and transactions in this

line carry increasing strength. Fractional-horsepower units are recording good business, with future account promising. A manufacturer of washing machines in northern New York has ordered a quantity of motors to cost $45,000 and further commitments are expected from this quarter. Electric refrigerator account is reaching new high levels with business more than 50 per cent in advance of this time a year ago. Floodlighting equipment for airport service is registering good sales. Construction projects are as follows:

The Company of Master Craftsmen, Inc., Flushing, L. I., plans an addition to cost $100,000. The American Cyanamid Company, New York, plans a phosphate rock plant at Tampa, Fla., to cost $3,000,000. The Multi-Cell Radiator Corporation, Buffalo, N. Y., plans a plant at Lockport, N. Y., to cost $80,000. The Union College, Schenectady, N. Y., will build an electrical engineering laboratory to cost $175,000. Burke & Olson, Brooklyn, N. Y., architects, have plans for an ice-manufacturing plant at Corona, N. Y., to cost $200,000. The Industrial Institute, Brooklyn, N. Y., plans a power plant at the proposed engineering institute at Toms River, N. J., entire project to cost $1,000,000. The Public Service Electric & Gas Company, Newark, N. J., plans an addition to the switching station at Clifton, N. J., to cost $1,000,000; also, a power substation at Montclair, N. J., to cost $30,000. Princeton, N. J., plans a power plant at the City Hospital, to cost $50,000. S. Steinmetz, Yonkers, N. Y., will build a cold storage and refrigerating plant to cost $200,000. The Susquehanna Collieries Company, Philadelphia, plans the electrification of coal properties at Shamokin, Pa., to cost $100,000. The Bethlehem Steel Company, Bethlehem, Pa., will make extensions in its plant at Johnstown, Pa., to cost $4,000,000. The Lehigh Valley Coal Company, Wilkes-Barre, Pa., will build a coal breaker at its North Wilkes-Barre properties, to cost $600,000. The Pittsburgh Plate Glass Company, Pittsburgh, will build an addition to its plant at Mount Vernon, Ohio, to cost $200,000. The Bureau of Yards and Docks, Navy Department, Washington, will receive bids until May 22 for an electric transmission line at the naval ammunition depot, Hawthorne, Nev., (Specification 5841). The Board of District Commissioners, Washington, has authorized an electrical and mechanical shop and laboratory at the pumping plant at Bryant Street, to cost $200,000.

Buying Maintains Steady Trend in New England

Small power apparatus is active, with motor sales outstanding as a feature in the market in the New England district. Switch and control orders are ahead of last month and scheduled material is selling briskly. An order for a 30,000-kw. turbo-generator for Western delivery will be placed soon and negotiations are under way for smaller units. Motor-generator sets are receiving more attention and recently a 110-hp. set was placed for eastern Massachusetts and additional sets, for a power plant and school, are under consideration. Small motor sales are encouraging and the sale of large motors is steady. The small motor sales totaled over $60,000. Switch and control apparatus is in good demand. Electric furnaces are in demand and the sale of glue pots up to 10 gal. capacity are gaining. Appliance sales show a steady gain, with refrigerators outstanding, and water heaters are coming to the front in various places. Construction projects are as follows:

The Wiremold Company, Hartford, Conn., plans an addition to its electric conduit plant to cost $65,000. The Blake & Johnson Company, Waterbury, Conn., plans an addition to its screw machine products plant to cost $45,000.

Volume of Business Increasing in the Middle West

The volume of business is gradually increasing from week to week and a general feeling of optimism is prevalent in the Middle West. Industrial activity is holding up well, railroad purchasing is relatively heavy and building activity is somewhat ahead of last week. The steel industry is operating close to capacity and automotive production schedules have been increased. The recent decline in metal prices has produced a somewhat hesitant attitude among buyers, but immediate requirements for thirty- to sixty-day periods are being placed. The utility companies are engaged with spring construction work and maintenance purchasing is comparatively high, one large utility company averaging $140,000 a day. Interesting orders that have been placed include one for twelve rotary converters valued at $660,000, one for uptakes and flues, etc., valued at $52,000, one for 6,000 5-amp. watt-hour meters and 675 Thompson meters of 5 to 3,000 amp. capacity and several construction orders aggregating $150,000. Jobbers' sales continue generally satisfactory. Construction projects are as follows:

The Wesley Steel Treating Company, Milwaukee, Wis., will build a power substation to cost $28,000. The Manitowoc Portland Cement Company, Manitowoc, Wis., plans a mill at Charlevoix, Mich., to cost $300,000. The Detroit Steel Products Company, Detroit, contemplates additions to cost $500,000. The Firestone Tire & Rubber Company, Akron, Ohio, contemplates a mill at Detroit, Mich., to cost $100,000. The Wayne County Detention Home, Detroit, will build an addition to its power plant to cost $40,000. The Consolidated Paper Company, Monroe, Mich., will build an addition to cost $150,000. The Marquette Cement Manufacturing Company, Chicago, will make extensions in its plant at Cape Girardeau, Mo., to cost $300,000. The Empire Metal Products Company, Chicago, plans a plant to cost $150,000. The Universal Stamp & Manufacturing Company, Chicago, plans an addition to cost $60,000. Indianapolis, Ind., plans a power plant at the City hospital to cost $500,000. The Cleveland Cap Screw Company, Cleveland, plans an addition to cost $70,000. The Hupp-Chandler Corporation, Cleveland, contemplates an addition to its automobile plant to cost $200,000. The Hocking Valley Railroad Company, Columbus, Ohio, plans electrically operated coal and ore docks at Presque Isle, Toledo, Ohio, to cost $5,000,000. The Gage County Electric Company, Beatrice, Neb., plans extensions in transmission lines to cost $125,000. La Crosse, Wis., and College View, Neb., plan ornamental lighting systems. The Creighton Electric Company, Creighton, Neb., plans an electric-operated ice-manufacturing plant to cost $100,000. The Chicago, Burlington & Quincy Railroad, Chicago, plans an addition in its electric-operated elevator at Gibson, Neb., to cost $200,000. The Van Ackeren Hydro-Electric Company, Cedar Rapids, Neb., plans extensions in transmission lines and power substations in vicinity of Horace, Scotia, Greeley and Primrose, Neb., to cost $100,000. The Globe Machinery & Supply Company, Des Moines, Iowa, plans a plant to cost $100,000. The Pfaff Baking Company, Mason City, Iowa, plans a plant to cost $200,000. The Shell Lumber Company, Sibley, Iowa, will build an electric-operated woodworking plant, to cost $75,000. The Central Alloy Steel Corporation, Massillon, Ohio, will make improvements at its plant to cost $1,000,000. The Master Electric Company, Dayton, Ohio, will build an addition to its plant.

Business Quiet on Pacific Coast —A Few Large Orders Noted

There is ample evidence that the recent freezing spell has hit practically every branch of the electrical industry on the Pacific Coast. The Santa Clara, Sacramento and upper San Joaquin valley territories suffered most, resulting in the cancellation of motor and canning equipment orders in such cities as San Jose and Merced and appreciably reduced sales. Industrial business is quiet, though manufacturers are still filling motor orders for shorts and extensions stimulated by the recent 15 per cent price increase. Power company business is good, ranging from such orders as one carload of 3½-in. fiber conduit, one carload of guy clamps, $1,500 worth of No. 8 Duplex rubber-covered wire to a $1,500,000 order for two turbines, each 50,000 kva., and transformers and switchboards are now under consideration by the Pacific Gas & Electric Company for its San Francisco station. Pole buying is brisk, the past week having seen orders for $5,000 worth of 8-in. 45-ft. and $2,500 worth of 9-in. 50-ft. for Fresno, two carloads of 35 and 40-ft. for Sacramento and an inquiry for 1,000 assorted treated poles of sizes 25 to 40 ft. for Honolulu. Lineman and construction tool sales have been light this year because of the light snowfall. Meter orders are fair and are generally placed in blocks of 100 or so for special destinations instead of as formerly in carload lots. Westinghouse reports a $25,000 sale of motors and controls to a Colorado sugar company.

The Allis-Chalmers Manufacturing Company, Seattle, on bids aggregating $854,000, secured contracts for apparatus for the second unit of the Lake Cushman hydro-electric project for the city of Tacoma. Bids have been opened by the city of Tacoma for $5,000 worth of insulators of various types and bids for initial work in connection with the town of Centralia's million dollar hydro-electric project, involving a 9½-mile power canal, will be opened on May 7. The British Columbia Electric Railway Company, Vancouver, B. C., has

awarded the machinery contracts approximating $680,000 for the first generating unit of the $7,000,000 development at Ruskin. The company is now taking bids for circuit breakers, switchboards, etc. The city of Seattle is taking bids for 300 50-ft. 9-in. top cedar poles and has opened bids for 50,000 lb. of No. 4/0 weatherproof, triple-braid, soft-drawn, seven-strand copper wire. Construction projects are as follows:

The Alviso Salt Company, San Francisco, Calif., plans a plant at Alviso, Calif., to cost $250,000. The Cramer Baking Company, San Diego, Calif., plans a plant at El Centro, Calif., to cost $100,000. Los Angeles, Compton, Oakland, Monterey Park and Salinas, Calif., plan ornamental lighting systems. The Growers' Refrigeration Company, San Francisco, Calif., plans a cold storage and refrigerating plant to cost $60,000. The Security Warehouse & Cold Storage Company, San Jose, Calif., plans a pre-cooling plant to cost $60,000. The Regan Forge & Engineering Company, San Pedro, Los Angeles, plans an addition to cost $100,000. The Stubbs Fruit & Cold Storage Company, Selah, Wash., plans a cold storage and refrigerating plant to cost $40,000. Hyrum, Utah, contemplates a municipal hydro-electric power plant to cost $70,000. Logan, Utah, will soon take bids for a Diesel engine and generator, for its municipal power plant. The American Minerals Company, Phoenix, Ariz., plans a milling plant to cost $100,000. Yuma, Ariz., and Great Falls, Mont., plan ornamental lighting systems.

Steady Demand for Control Apparatus in St. Louis

The large railway companies are buying shop equipment in better volume and the manufacturing companies are still buying motors and control apparatus in quantity in the St. Louis district. Activity in the mining districts of eastern and western Missouri continues. The contracts reported placed are as follows: Two 650-hp. motors costing $8,000, and a miscellaneous lot of motor-generator sets and motor-driven pumps costing $15,000 for companies in the southeast Missouri lead belt, a bank of transformers with substation equipment for a mining company in the Missouri zinc district costing $9,000, an engine-driven generator of 1,000 kva. costing $9,000 for a St. Louis manufacturing company, arc-welding sets for a company in central Illinois costing $7,000, a lot of motors for driving machine tools in the shop of a railway company costing $6,000, and six motor-driven air compressors for train line charging for a Southwestern railway costing $11,000. Construction projects are as follows:

Monroe City, Mo., plans extensions in its municipal power plant to cost $20,000. J. Perry Burrus, Dallas, Tex., and associates plan a feed and grain mill to cost $200,000. St. Joseph, Mo., and Lockhart, Tex., plan ornamental lighting systems. The Lubbock Poultry & Egg Company, Lubbock, Texas, plans a packing plant including refrigerating and cold storage department to cost $125,000. Swift & Company, Chicago, Ill., plan a cold storage plant at Palestine, Texas, to cost $30,000. The New York Buyers, Inc., San Antonio, Texas, plans a cold storage and refrigerating plant to cost $135,000.

Activities of the Trade

General Electric Orders Up 27 per Cent

Business in the electrical equipment field has shown a sharp increase during the first quarter of 1929. Orders received by the General Electric Company for the quarter amounted to $101,365,208, compared with $79,925,840 for the corresponding three months of last year, an increase of 27 per cent. A similar increase will be shown by certain of the other large manufacturers, according to information received by the ELECTRICAL WORLD.

General Electric Company sales billed for the first three months of 1929, announced by President Gerard Swope, amounted to $83,385,015, compared with $71,640,790 for the corresponding period last year, an increase of 16 per cent. Profit available for dividends on common stock for the first quarter of 1929 was $13,862,298, compared with $11,261,842 for the corresponding three months of 1928.

The comparative statement of sales and earnings for the three months is shown in the accompanying table.

	1929	1928
Net sales billed	$83,385,015	$71,640,790
Less: Cost of sales billed, including operating maintenance and depreciation charges, reserves and provision for all taxes	73,206,207	63,404,807
Net income from sales	10,178,808	8,235,982
Other income, less interest paid and sundry charges	4,327,177	3,669,504
Profit available for dividends	14,505,986	11,905,487
Less: Cash dividends on special stock	643,688	643,644
Profit available for dividends on common stock (7,211,481 - 84/100 shares issued)	$13,862,298	$11,261,842

The profit available for common stock for the quarter is equivalent to $1.92 per share in 1929 and $1.56 per share in 1928.

Electric Companies Merge

According to an announcement made by Edward N. Hurley, Jr., president of the Electric Household Utilities Company of Chicago, the merger has been completed of his English operating company with the recently consolidated British Thomson-Houston Company, Ltd., and the Edison-Swan Electric Company, Ltd. Mr. Hurley said this new affiliation would greatly increase the volume of the electrical products of his company in Great Britain.

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, Plainville, Conn., manufacturer of electrical supplies, announces that A. H. Bergendahl has been appointed manager of its New York office and G. U. Van Cleef, who for three years has been the company's field specialist, will take over Mr. Bergendahl's old Cleveland, Columbus and Pittsburgh territory.

Allis-Chalmers Bookings Up 58.42 per Cent

The earnings of the Allis-Chalmers Manufacturing Company for the quarter ended March 31, 1929, show a net of $1,013,374 after all charges including federal income taxes. This is equivalent to $3.65 per share on the outstanding common stock and compares with a net profit of $675,600, or $2.60 per share, for the corresponding period last year.

Bookings for the 1929 quarter were $13,260,192, contrasted with $8,370,537, an increase of 58.42 per cent. Unfilled orders March 31, 1929, amount to $12,998,553, as against $9,681,214 at the close of 1928, a 34.26 per cent increase. The figures for these two quarters are as shown in the accompanying table.

Quarter ended March 31	1929	1928
Orders booked	$13,260,192	$8,370,537
Average per month	4,420,064	2,790,179
Sales billed	9,942,853	8,415,253
Net profit	1,013,374	675,600
Percentage increase in net profit 1929 over 1928		.50

Servel Shows Profit

Servel, Inc., New York City, for the quarter ended March 31 shows a profit of $176,478, after interest charges, comparing with a loss of $160,441 in the first quarter of 1928. The capital stock on December 31, 1928, consisted of $4,280,000 of 7 per cent preferred and 1,150,530 no-par shares of common.

Illumination Schools Unite

The National and Edison Lamp Works of the General Electric Company have, in the past, held several illumination schools during the year for members of their electric utility and dealer customers. Through the duplication of equipment, the standardization of instruction and the interchange of instructors between the two schools, the Nela School of Lighting at Cleveland and the Edison Lighting Institute at Harrison, it is now possible that travel time and expenses may be minimized through the attendance of customers of either company at the illumination school nearest to them.

For the remainder of 1929 the following schedule is prepared: May 6, "Home Lighting Course" at Harrison; June 10, "General Illumination Course" at Cleveland; June 17, "General Illumination Course" at Harrison; Sept. 19, "Lighting Service Conference" at Harrison; Oct. 7, "General Illumination

Course" at Harrison; Oct. 14, "General Illumination Course" at Cleveland; Nov. 4, "Home-Lighting Course" at Cleveland.

THE STANDARD UNDERGROUND CABLE COMPANY, Pittsburgh, a division of the General Cable Corporation, announces that George W. Kydd has joined its sales organization and will specialize in railroad sales work. Mr. Kydd was formerly with the Baltimore & Ohio Railroad Company as signal valuation engineer.

THE CLARK CONTROLLER COMPANY, Cleveland, has let a contract for an addition to its present building to take care of the increased business. The addition will make a 50 per cent increase over the present factory space.

THE WESTINGHOUSE LAMP COMPANY, 150 Broadway, New York City, announces that R. E. Carlson, one of the outstanding automotive lighting experts of the country, has joined the commercial engineering staff of its company. Mr. Carlson will head the automotive lighting activities of the organization.

THE KELVINATOR CORPORATION, Detroit, announces that Earl Lines, for the past three years advertising and sales promotion manager of the Leonard Refrigerator Company, Grand Rapids, Mich., has been appointed director of advertising and sales promotion of its company, succeeding J. A. Corcoran, who has been appointed manager of its New York branch.

THE KUHLMAN ELECTRIC COMPANY, Bay City., Mich., manufacturer of power, distribution and street-lighting transformers, announces the appointment of S. L. Currier, 833 Union Trust Building, Cincinnati, Ohio, as its representative in the Cincinnati territory.

THE AMERICAN ENGINEERING COMPANY, Philadelphia, manufacturer of the "Taylor" stoker, "Lo-Hed" electric hoists, etc., announces the removal of its New York City offices from 100 Broadway to the American Radiator Building, 40 West 40th Street.

THE DAMPNEY COMPANY OF AMERICA, Hyde Park, Boston, manufacturer of "Apexior" protective coatings for power plant equipment, announces the opening of a branch office at Room 502 Engineering Building, 114 Liberty Street, New York City.

THE GENERAL ELECTRIC COMPANY has received an order involving $1,000,000 for 21 giant transformers to be operated on the first 220,000-volt system in New England. The transformers will allow electrical energy from the Fifteen-Mile Falls lower development of the Grafton Power Company at Inwood, Vt., on the Connecticut River, to be sent 135 miles to the Tewksbury, Mass., substation of the New England Power Company. Both of these companies are members of the New England Power Association and this development represents only a part of the entire project.

New Equipment Available

Fan Incorporated in Air Drawing Oven

A new air drawing oven, type AD, for drawing carbon steel at temperatures up to 750 deg. F. is announced by the General Electric Company. The quality is said to be improved and production increased in this oven as a result of the use of a fan for agitating the air around the work. Any temperature up to 750 deg. F. can be obtained, which covers the full range of temperatures required for drawing and bluing carbon steel. Only 0.9 kw. is required to maintain a temperature of 500 deg. F. in the oven. By installing a time switch the oven can be brought up automatically to temperature before the workmen arrive and can be cut off automatically at closing time.

The fan is located in the heating chamber and is driven by a vertical motor mounted on top of the oven. As a result of its use greatly increased production is said to be possible because much less time is needed to heat a given charge than would be required by a "still air" type of oven.

The oven is of double wall construction throughout with the intervening space of 4 in. filled with high-grade heat-insulating material.

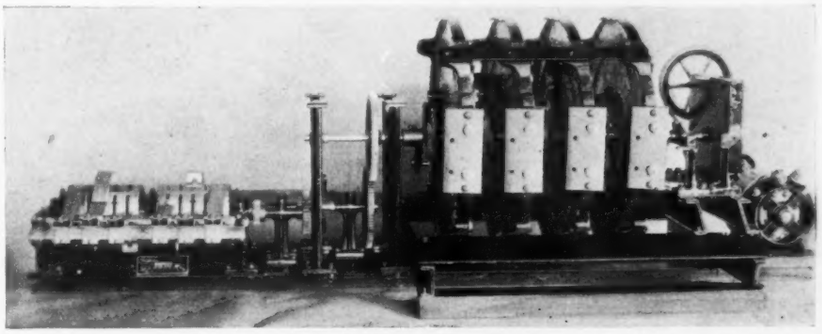
Temperature control is automatic, consisting of an inclosed contactor panel and a controller. The latter can be set at any point up to 750 deg. and will hold the oven at a uniform temperature within a margin of 5 deg. without further attention on the part of the workman. The heat sensitive device located in the oven chamber governs the operation of the controller and the latter actuates the contactor through a relay opening or closing the unit circuit as the temperature of the oven tends to rise above or fall below the setting. A recorder controller may be used with the oven for obtaining a continuous temperature record.

The normal rating of the oven is 5 kw. and the capacity is 100 lb. of steel per hour to 500 deg. F.

THREE-WIRE POLARIZED CAPS AND RECEPTACLES of a new design, including composition caps, flush motor attachment cap, cord connector body and some three-wire polarized flush receptacles, are announced by the Bryant Electric Company of Bridgeport, Conn. One of these, No. 9116, is useful on different types of circuits. It can be used, for instance, on a three-phase circuit with or without a grounded neutral and also on a two-wire circuit, leaving the third pole of the receptacle available for the grounding conductor. When used on the circuit described last it is necessary to connect the identified terminal to some part of the grounded metal box in which it is mounted.

Dimmer and Four-Brush Flasher

A rather novel piece of control apparatus consisting of a four-plate dimmer and a four-brush flasher which will be used in connection with a display of the Victor Talking Machine Company of Camden, N. J., at the exposition being held in Barcelona, Spain, is announced by the Reynolds Electric Company of Chicago. The lights, in four colors, are dimmed from full bright to cherry red and back to full bright. The flasher section acts as a control for the dimmer plates. The equipment is fully automatic and is driven by a Reynolds motor.



Portable Electric Hand Saw

A new electric circular hand saw driven by a 4/10-hp. motor and mounted on a flexible frame is manufactured by the Electric Hand Saw Company of Seattle. The saw may be used "free hand" or with a miter box or saw table. The miter box and saw table are two accessories especially designed for use with the new device. A rafter gage for cutting rafters and studding which is adjustable for bevels and double miter and cuts at angles up to 70 deg. is also available.

The circular saw is 21 in. in circumference and has a free running speed of 2,707 r.p.m., or a peripheral speed of 4,737 ft. The motor used is a Westinghouse universal type, for use with either direct or alternating current on voltages of 110 to 220 and frequencies up to 60 cycles, with a speed of 8,000 r.p.m.

Electrical Patents

Announced by U. S. Patent Office

(Issued April 9, 1929)

1,708,349. TRAFFIC-SIGNALING DEVICE; H. Alles, San Francisco, Calif. App. filed Sept. 5, 1925.

1,708,354. CAVE FINDER; J. J. Cabot, Charleston, W. Va. App. filed Oct. 13, 1927.

1,708,384. ELECTRICAL CONTROL SYSTEM; H. E. Fox, Pittsburgh, Pa. App. filed Jan. 26, 1925.

1,708,386. ELECTRICAL PROSPECTING DEVICE; N. Gella, Cassel - Wilhelmshohe, Germany. App. filed June 30, 1926.

1,708,408. CIGAR LIGHTER; J. R. Ayotte, Chicago, Ill. App. filed Dec. 6, 1926.

1,708,422. ELECTRIC COOKING STOVE; G. Klumpp, New York, N. Y. App. filed April 4, 1927.

1,708,430. ELECTRICAL SIGNALING SYSTEM; F. Perdue, Rochester, N. Y. App. filed Jan. 25, 1926.

1,708,431. ELECTRIC SWITCH; J. Pfeifer, Springfield, Ohio. App. filed June 7, 1926.

1,708,438. MULTIPLE SWITCH; J. S. Bohen, Springfield, Vt. App. filed March 22, 1927.

1,708,512. ELECTRIC HEATING APPARATUS; A. S. MacDonald, Great Neck, N. Y., and C. C. Waite, Roselle Park, N. J., and E. M. Huggins, New York, N. Y. App. filed Aug. 28, 1923.

1,708,522. TOASTER; W. L. Pross, Jr., Danbury, Conn. App. filed Sept. 27, 1927.

1,708,526. ROTARY CHEMICAL FURNACE; L. Tocco and M. Landi, Paris, France. App. filed June 22, 1926.

1,708,541. DISTANT CONTROL MECHANISM; F. R. House, Baldwin Harbor, N. Y. App. filed April 2, 1927.

1,708,544. METHOD AND ARRANGEMENT FOR ELECTRICAL MEASUREMENTS; W. Kummerer, Berlin, Germany. App. filed April 6, 1925.

1,708,546. APPARATUS FOR VARYING ELECTRICAL VALUES; A. Leib, Berlin, Germany. App. filed March 26, 1923.

1,708,576. MOLDING MIXTURE; L. M. Hull, Boonton, N. J. App. filed June 30, 1926.

1,708,580. HEATING SYSTEM; R. C. Kerlaouezo, L. W. Evans, and S. B. Merry, Richmond, Calif. App. filed Sept. 17, 1927.

1,708,618. APPARATUS FOR CONTROLLING ELECTRIC CURRENT; G. H. Hart, West Hartford, Conn. App. filed Aug. 4, 1924.

1,708,619. ELECTRIC TIME SWITCH; G. H. Hart, West Hartford, Conn. App. filed March 4, 1927.

1,708,642. SYNCHRONIZING DEVICE; J. Vopel, Berlin-Neukolln, Germany. App. filed Aug. 25, 1925.

1,708,661. BURGLAR-ALARM DEVICE; M. J. Cawley, New York, N. Y. App. filed Aug. 19, 1927.

1,708,678. ELECTRICITY RECTIFIER; T. J. Murphy, Stamford, Conn. App. filed May 18, 1925.

1,708,695. ELECTRIC SWITCH; H. V. Haight, Sherbrooke, Quebec, Can. App. filed Dec. 17, 1925.

1,708,744. ELECTRIC SWITCH; G. Stern, Oberschoneweide, near Berlin, Germany. App. filed March 16, 1928.

1,708,747. CONTROL OF DYNAMO-ELECTRIC MACHINES; M. A. Whiting, Schenectady, N. Y. App. filed Aug. 16, 1927.

1,708,751. RECTIFYING SYSTEM; S. Aoki, Ebara, Tokyo, Japan. App. filed April 25, 1927.

1,708,756. MACHINE FOR MAKING INCANDESCENT LAMPS AND SIMILAR ARTICLES; J. T. Fagan, F. J. Rippl, and J. J. Malloy, Cleveland, Ohio. App. filed Feb. 21, 1925.

1,708,769. WELDING MACHINE; J. X. Mathieu, Pittsfield, Mass. App. filed Nov. 24, 1926.

1,708,772. PROTECTIVE MEANS FOR ELECTRIC FURNACES; A. N. Otis, Schenectady, N. Y. App. filed Sept. 10, 1925.

1,708,775. TRANSFORMER; W. E. Paul, Schenectady, N. Y. App. filed May 18, 1928.

1,708,785. ELECTRIC CABLE; W. C. Clark, Schenectady, N. Y. App. filed May 29, 1924.

1,708,789. COMBINED RELAY AND INDICATOR; C. I. Hall, Fort Wayne, Ind. App. filed Feb. 21, 1924.

1,708,806. RELAY SYSTEM; C. W. Stone, Niskayuna, N. Y. App. filed Dec. 29, 1923.

1,708,809. PRESSURE-MEASURING INSTRUMENT; L. W. Thompson, Schenectady, N. Y. App. filed Nov. 1, 1927.

1,708,815. PROCESS OF WELDING CAST IRON AND FILLER ROD THEREFOR; H. V. Willie, Philadelphia, Pa. App. filed April 14, 1921.

1,708,827. LOOM CLAMP FOR WALL BOXES; C. A. Black and W. S. Thibault, Cleveland, Ohio. App. filed April 4, 1927.

1,708,833. ELECTRIC FURNACE; P. K. Devers, Lynn, Mass. App. filed July 13, 1925.

1,708,850. REGULATION OF INDUCTION-MOTOR CASCADES; W. Seiz, Baden, Switzerland. App. filed Aug. 11, 1927.

1,708,859. ELECTRICAL APPARATUS; H. M. Acly, Pittsfield, Mass. App. filed Jan. 11, 1927.

1,708,865. ELECTRICAL SYSTEM; W. F. Bouché, Buffalo, N. Y. App. filed Dec. 31, 1925.

1,708,870. MAINTAINING DISTRIBUTION OF LOAD BETWEEN LEONARD DRIVES; A. K. Bushman, Oak Park, Ill. App. filed Sept. 28, 1926.

1,708,875. THERAPEUTIC BLANKET OR THE LIKE; J. H. Dequer, Los Angeles, Calif. App. filed Nov. 28, 1924.

1,708, 876. INSULATOR; G. E. Eckert, East Liverpool, Ohio. App. filed June 21, 1923.

1,708,884. MEANS FOR REPRODUCING POSITION; E. M. Hewlett and W. W. Willard, Schenectady, N. Y. App. filed April 22, 1925.

1,708,886. AUTOMATIC CIRCUIT-CONTROLLING DEVICE; J. A. Jackson, Schenectady, N. Y. App. filed Aug. 26, 1925.

1,708,887. SYSTEM OF MOTOR CONTROL; J. A. Jackson, Schenectady, N. Y. App. filed Nov. 21, 1925.

1,708,889. ELECTRODE FOR ALKALINE ACCUMULATORS; A. Levin, Redditch, England. App. filed Feb. 27, 1926.

1,708,894. METER - REGULATING DEVICE; A. Peters, Zug, Switzerland. App. filed Feb. 27, 1925.

1,708,909. ROTOR FOR INDUCTION MOTORS; M. C. Spencer, East Orange, N. J. App. filed Dec. 17, 1925.

1,708,910. MEANS FOR OPERATING POLYPHASE MOTORS FROM A SINGLE-PHASE SOURCE; M. C. Spencer, East Orange, N. J. App. filed March 1, 1927.

(Issued April 16, 1929)

1,08,936. MAGNETIC MATERIAL; P. P. Cioffi, Brooklyn, N. Y. App. filed Dec. 23, 1926.

1,708,938. HIGH-FREQUENCY SOUND SIGNALING; I. B. Crandall, East Orange, N. J. App. filed Nov. 25, 1919.

1,708,961. ELECTRIC HEATER; C. C. Abbott, Pittsfield, Mass. App. filed July 6, 1926.

1,708,963. MULTIPLE-FUSE DEVICE; F. W. Baum, Newark, N. J. App. filed Feb. 8, 1923.

1,708,972. ELECTRICITY METER; R. C. Lanphier and F. C. Holtz, Chicago, Ill. App. filed June 14, 1922.

1,708,977. ELECTRIC WELDING MACHINE; A. M. Stanley, Lynn, and J. E. Sims, Quincy, Mass. App. filed Nov. 25, 1921.

1,708,978. ATTACHING DEVICE FOR OUTLET BOXES; E. J. S. Swanson, Erie, Pa. App. filed March 28, 1927.

1,708,989. SIGNALING SYSTEM; T. U. White, Pittsburgh, Pa. App. filed Dec. 15, 1924.

1,708,995. ELECTRIC SOLDERING IRON; C. C. Abbott, Pittsfield, Mass. App. filed July 6, 1926.

1,708,996. MERCURY SWITCH; W. R. Armstrong, Chicago, Ill. App. filed April 6, 1928.

1,709,022. TANK FOR CHROMIUM-PLATING BATHS; L. D. Jensen, Chicago, Ill. App. filed April 12, 1927.

1,709,031. SUPERVISORY CONTROL SYSTEM; J. L. McCoy, Wilkinsburg, Pa. App. filed May 22, 1924.

1,709,052. ELECTRIC HEATING RADIATOR; A. Anderson, Chicago, Ill. App. filed Dec. 16, 1925.

1,709,055. SYNCHRONOUS MOTOR; H. J. Blakeslee, West Hartford, Conn. App. filed Sept. 16, 1927.

1,709,067. INDICATING SYSTEM; J. C. Field, Orange, N. J. App. filed Oct. 22, 1924.

1,709,097. ALARM SYSTEM; W. C. Roe, New York, N. Y. App. filed June 19, 1923.

1,709,120. COMBINATION OF INDUCTION MACHINE AND COMMUTATOR MACHINE; L. Dreyfus, Vasteras, Sweden. App. filed Oct. 14, 1927.

1,709,134. ELEVATOR; J. D. Lewis, Yonkers, N. Y. App. filed Dec. 7, 1921.

1,709,161. CONTROL SYSTEM FOR ELEVATORS; R. A. Waite, Yonkers, N. Y. App. filed Jan. 19, 1926.

1,709,187. KNOCK-OUT FOR SWITCH BOXES AND THE LIKE; C. Newman, New York, N. Y. App. filed Sept. 12, 1927.

1,709,223. PORTABLE ELECTRIC HEATER; W. E. Lyon, San Diego, Calif. App. filed March 8, 1928.

1,709,268. ELECTRODEPOSITION OF METALS; T. W. A. Hutchins, Davenham, near Northwich, England. App. filed June 30, 1925.

1,709,281. DRAW - OUT - TYPE ELECTRIC SWITCH GEAR; G. Pallin, Manchester, England. App. filed March 30, 1926.

New Trade Literature

PERMAFLECTOR FLOODLIGHTS. — The Pittsburgh Reflector Company, 304 Ross Street, Pittsburgh, is distributing bulletin No. 1, which describes and illustrates the permaflector floodlighting for use in night illumination of building exteriors, monuments, fountains, signs, construction areas, recreational areas, railway classification yards and airports.

SWITCHBOARDS, TERMINAL BLOCKS AND OIL CIRCUIT BREAKERS.—Leaflet No. 20,379 issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., covers its truck type switchboards and switching equipment. It contains detailed descriptive material on the application, distinctive features and the construction of the truck type switchboards with photographs and drawings to illustrate. The company also is distributing leaflet No. 20,405 covering its unbreakable terminal blocks. The standard method of wiring the blocks is shown and the mounting of the blocks on steel brackets is described and illustrated. Circular C-1824 issued by the company describes and illustrates its type 0-11, 0-22, 0-33 and 0-44 electrically operated oil circuit breakers for indoor service.

TIME SWITCHES. — The Tork Clocks, Inc., 12 East 41st Street, New York City, has issued bulletin No. 29,032 which describes and illustrates its types ZEO and ZS astronomical dial clock switches.

MOTORS, TRANSFORMERS, ETC.—The General Electric Company, Schenectady, N. Y., is distributing the following bulletins: GEA-302A describing the G-E squirrel-cage motors for sugar centrifugals, GEA-517B describing its type CD totally incloseed fan-cooled direct-current motors, GEA-977A covering the type RKS single-phase capacitor motors, GEA-800A describing its type RO "Novalux" constant current transformers, GEA-1086 describing its automatic station type RF "Novalux" constant-current transformers, GEA-926A covering its types FK, FKO, FHK and FHKO-139 station oil circuit breakers, GEA-966A covering its type MI-1 metal clad switchgear for indoor service, GEA-1106 describing the CR7006-F1 magnetic switch, GEA-1115 describing the G-E electric furnaces for vitreous enameling, GEA-750A covering the G-E induction frequency converters, GEA-745A describing its improved brush-holders and ventilating covers for GE-265 railway motors, GEA-588B covering the G-E centrifugal compressors and GEA-1095 covering its ground clamps for outdoor stations.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington by mentioning the number:

Purchase and agency are desired in Tegucigalpa, Honduras (No. 37,908), for storage batteries.

An agency is desired in Montevideo, Uruguay (No. 37,932), for storage batteries.

Purchase is desired in Accra, West Africa (No. 37,933), of battery charging sets and electric paint and lacquer spraying machines.

Purchase is desired in Quebec, Canada (No. 37,894), of church lighting fixtures.

Purchase or agency is desired in Sao Paulo, Brazil (No. 37,936), for electric dish washers and drink mixers, sandwich toasters, etc., for fountains.

Purchase and agency are desired in Quebec, Canada (No. 37,893), for glass globes for street lighting standards.

An agency is desired in Mannheim, Germany (No. 37,892), for hotel electrical appliances.

An agency is desired in Vancouver, Canada (No. 37,928), for table and floor lamps and shades.

An agency is desired in Teheran, Persia (No. 37,926), for electric motors of various sizes and powers.

An agency is desired in Montreal, Canada (No. 37,825), for electrical trucks.